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AGRICULTURAL MARKETING IN INDIA

Report on the

ANALYSIS OF FRUIT AND VEGETABLE PRODUCTS

(1953-54)

DIRECTORATE OF MARKETING AND INSPECTION
MINISTRY OF FOOD AND AGRICULTURE
GOVERNMENT OF INDIA

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(Continued at the inside of the last title Cover.)

PREFACE

One of the major activities under the F.P.O. 1948 issued under section 3 of Essential Supplies (Temporary Powers) Act, 1946 for control over the manufacture of fruit products is the enforcement of minimum standards of quality prescribed under said order. When the working under the F.P.O. 1948 was re-centralised from 1st January 1952 under the administrative control of the A.M.A. to the G/I as a Licensing Officer, arrangements for drawing adequate number of samples all over the country and getting them analysed by a competent laboratory and thus to make this aspect along with others effective.

For the purposes of administration of the F.P.O. 1948, the country was divided into 6 zones. One Dy. M.D.O. (F.P.) was appointed for each zone, with headquarters at Delhi, Bombay, Madras, Calcutta, Lucknow and Amritsar. One of the main duties of these officers was to draw samples from the manufacturers of Fruit Products and also from dealers in the distributing towns and cities. These officers were required to remove the traces of identity of the manufacturers from the samples collected and send the samples to the laboratory for analysis under code numbers. Arrangements were simultaneously made to get the samples analysed at a laboratory set up for the purpose at the C.F.T.R.I., Mysore.

On receipt of the results of analysis, the officers de-codify the numbers and communicate defects, if any, to the manufacturers for taking suitable action for improving the quality of their products. In cases where the samples did not conform to the quality standards laid down under the F.P.O. 1948 a strict warning was issued to the manufacturers. As a further check, more samples were collected by the officers concerned of the varieties of different fruit products manufactured by the firms and if on repeated analysis the samples were found not conforming to the standards, a suitable action was instituted against the party.

It is observed that in most of the cases, the defects were due to— (a) inadequate knowledge of specifications by the manufacturers; (b) absence of checking the quality of their finished products prior to their entry into the market. Advice was tendered to the manufacturers on the various defects in their products which was well received by them and many improvements were brought about by them.

During the year 1953-54, 4,622 samples were analysed. The samples were representative as they covered all fruit products, belonging to different regions and season and they also represented variations by manufacturers. The results of analysis of such large number of samples consequently gave a valuable data which on consideration indicated

certain broad trends. The results of analysis were consolidated and on examination communicated certain trends. It was thought proper to publish the data in a consolidated form along with suggestions for improvements so that it will be useful to the manufacturers.

I take this opportunity of thanking Dr. V. Subramanian, Director, C.F.T.R.I., Mysore and Dr. Girdhari Lal, Assistant Director, C.F.T.R.I., Mysore, for having taken keen interest in this work and supplying the collected results of analysis.

This report has been compiled by Shri P. H. Bhatt, S.M.D.O., Fruit Products, in this Directorate.

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EXPERIMENT STATION SIMLA
Ds/ACC No 87
Date 27/5/65
CFTRI

REPORT ON THE ANALYSIS OF FRUIT AND VEGETABLE PRODUCTS (1953-54)

Introduction

The indigenous methods of preservation of fruits and vegetables have been known to common man since times immemorial. The simple methods of sun-drying of fruits and vegetable, pickling of varieties of pickles and preservation of different kinds of preserves from various fruits have been practised in the Indian homes. Even to-day large amounts of fruits and vegetables are being used in the Indian homes for preservation purposes particularly for pickles, chutneys, sauces, preserves, *sharbats* and syrups. Jams, jellies, marmalades, squashes, sauces, cordials, fruit juices, tomato products, canned fruits and vegetables and carbonated fruit juices are of recent origin. Owing to industrialization and consequent concentration of population in towns and cities and also because of better standard of living, the demand for these products has been gradually increasing. Consequently a large number of small manufacturers came into existence all over India. It is mainly a small and cottage-scale type. Its development as an industry does not date back to more than 25 years. Amongst the fruit and vegetable products manufactured, the production of preserves, chutneys, pickles, *sharbats* and syrups is indigenous. The average estimated production, as brought out by the working of the Fruit Products Order, in the years 1951-53 amounts to 12,967 tons valued at Rs. 181·87 lakhs. The production and value of various fruit and vegetable products during the years 1951, 1952 and 1953 are given in Table I and the graph facing page 2.

TABLE I.—*Estimated production and value of various fruit and vegetable products in the years* 1951—53.

Product	1951		1952		1953	
	Quantity Tons	Value Rs. (In thousands)	Quantity Tons	Value Rs. (In thousands)	Quantity Tons	Value Rs. (In thousands)
1	2	3	4	5	6	7
I. *Beverages*	2,663	5,300	2,253	4,322	2,324	4,451
1. Squashes and crushes	1,329	2,631	869	1,988	899	2,022
2. Cordials and Barley waters	164	397	104	328	105	256
3. Juices	174	216	332	468	478	879
4. Fruit syrups	436	905	101	254	75	137
5. Synthetic syrups	560	1,151	847	1,284	767	1,158
II. *Canned fruits and vegetables*	2,667	6,332	2,333	3,784	1,240	2,305
1. Canned fruits	1,050	2,316	1,036	1,731	696	1,572
2. Canned vegetables	1,617	4,016	1,297	2,053	544	733
III. *Jams, jellies and marmalades*	769	1,653	440	949	413	921
1. Jams	509	1,014	295	609	225	467
2. Jellies	155	391	117	275	151	365
3. Marmalades	105	248	28	65	37	89
IV. *Chutney*	637	1,220	713	1,302	639	1,238

TABLE I—*contd.*

	1	2	3	4	5	6	7
V.	*Preserves and crystallised fruits*	1,929	2,367	1,408	1,820	1,151	1,450
	1. Preserves . . .	1,631	2,185	1,326	1,640	1,025	1,157
	2. Crystallised and candied fruits.	298	182	82	180	136	293
VI.	*Tomato products* . . .	325	511	219	449	218	431
VII.	*Vinegar*	367	388	502	390	532	444
VIII.	*Pickles*	1,564	977	1,364	809	1,787	1,058
IX.	*Carbonated beverages and others*	2,024	2,766	2,509	3,289	5,912	3,565
	TOTAL .	12,945	21,514	11,741	17,113	14,216	15,864

In 1953 the total number of licenced manufacturers were about 602 while in 1954 the number was 662. The majority of the establishments are located in big cities such as Bombay having 108, Calcutta 64, Delhi 61, Madras 56, Amritsar 27, Lucknow 20 and Bangalore 19.

The State-wise distribution of fruit products manufacturers in India given in Table II below and the map facing page 3 shows that the States of Bombay, West Bengal, P.E.P.S.U., U.P., Madras and Delhi make up 509 and the rest is made by the remaining States.

TABLE II.—*Distribution of fruit products factories in various States in India*

Serial No.	State	Total No. of factories	
		1953	1954
1	Ajmer	4	4
2	Assam	7	9
3	Bhopal	Nil.	1
4	Bihar	4	7
5	Bilaspur	Nil.	..
6	Bombay	137	152
7	Coorg	1	1
8	Delhi	61	61
9	Himachal Pradesh	2	2
10	Hyderabad	7	13
11	Andhra	5	4
12	Kutch	Nil.	..
13	Madras	73	87
14	Madhya Bharat	4	8
15	Madhya Pradesh	10	13
16	Manipur	Nil.	..
17	Mysore	18	21
18	Orissa	Nil.	..
19	Pepsu	6	11
20	Punjab	79	90
21	Rajasthan	18	22
22	Saurashtra	Nil.	..
23	Skikkim	Nil.	..
24	Travancore-Cochin	7	9
25	Tripura	Nil.	..
26	Uttar Pradesh	78	75
27	West Bengal	81	72
28	Vindhya Pradesh	Nil.	..
	TOTAL .	602	

With a view to improving the standard of manufacture the Government of India issued Fruit Products Order in the year 1946 under which compulsory licencing system has been introduced for the manufacture of fruit products. This Order was revised and issued as Fruit Products Order, 1948. It has been further revised and issued as Fruit Products Order, 1955 under the Essential Commodities Act, 1955. The fruit products manufactured have to conform to the minimum standards laid down in this Order.

Many manufacturers produce more than one type of fruit products and the number of items prepared by the manufacturers have been quite large in certain cases but the small manufacturers generally deal in one or two items only like synthetic syrups, synthetic vinegars or pickles. Table III shows the number of manufacturers manufacturing different categories of fruit products.

TABLE III.—*Number of manufacturers according to the categories of fruit products in* 1953 *and* 1954

Products	1953	1954
1. Crushes, squashes, cordials, barley water	186	265
2. Synthetic and genuine syrups	308	399
3. Canned fruits, juice and pulp	103	78
4. Canned vegetables in brine and curries	50	51
5. Jams	140	154
6. Jelly and marmalade fruit cheese	127	..
7. Candied, crystallised or glaced fruit, peel and vegetables	40	..
8. Murabbas or preserves	119	169
9. Chutney	156	180
10. Tomato ketchup	114	132
11. Vinegar	230	297
12. Pickles	225	276

The fruit preservation industry is confined to small-scale manufacturers as out of 602 licensed manufacturers only 57 factories had a production of over Rs. 50,000 per annum in 1953. A large number of manufacturers have been carrying on this industry from generation to generation and have brought with them traditional practices of processing and manufacture. They are still adhering to them. The manufacturers are not fully conversant with the standards of quality prescribed under the Fruit Products Order, 1948 and hence in most of the cases wherever the defects have been noted in the samples, the basic cause has been that of ignorance.

During the year 1953, 4,622 samples of fruit products were collected and analysed. The reports of analysis of fruit products falling in various categories are tabulated in Table IV. They indicate that nearly 18 per cent. of the samples did not conform to specifications.

TABLE IV.—*Percentage of samples of various categories of fruit products which did not conform to minimum specifications under the Fruit Products Order, 1948.*

Sl. No.	Products	Total No. of samples analysed	Percentage of the total number of samples	No. of samples not conforming	Percentage of samples not conforming
1	Beverages	1,138	24·6	192	16·8
2	Canned fruits and vegetables	877	81.9	101	12.6
3	Jams, jellies and marmalades .	1,095	23.8	154	14.0
4	Preserves	195	4·2	43	22.0
5	Chutneys	221	4·8	54	24·4
6	Tomato products . . .	386	8·3	195	50·5
7	Pickles	430	9·3	49	11·4
8	Vinegar	280	6·1	50	17.9
	TOTAL .	4,622	100·0	838	17·9 (average)

A large number of manufacturers have been complacent about the sub-standard quality products produced by them. They must realise that the consumer loses confidence in their products one out of six times he purchases the fruit products. Apart from the loss of confidence and increased prejudice of the consumer against the indigenous products, the manufacturer himself suffers in the invisible loss due to spoiled products. In a number of cases the product has been found to be unpalatable, unattractive, fermented or spoiled. The manufacturers should see that not only the minor defects are removed completely but they should try to reduce the spoilage which may occur due to chances beyond the manufacturers' control, to a minimum.

The industry broadly falls into three classes, *viz.*, (*a*) large-scale, *i.e.*, those whose production is above Rs. 1,00,000 per year; (*b*) small-scale, *i.e.*, whose production is over Rs. 10,000 but below Rs. 1,00,000 per year; and (*c*) cottage-scale, *i.e.*, whose production is below Rs. 10,000 per year. The analysis reports of each class of fruit products manufacturers indicate that in case of beverages, preserves, chutneys and vinegar the cottage-scale manufacturers have fared badly while in the case of tomato ketchup the large-scale manufacturers have higher percentage of samples not conforming to specifications to their credit. In the case of canned fruits, vegetables, jams and jellies and marmalades there is not much variation between different classes of manufacturers. The products of even the small and cottage-scale manufacturers proved to be of good standard. The

number of samples from cottage scale manufacturers which did not conform to specifications were 6 per cent. higher than those of large-scale manufacturers. It was only 1 per cent. more than those of the small-scale manufacturers. There was, therefore, not much difference between the performance of small and cottage-scale manufacturers.

TABLE V.—*Number of samples of various fruit products manufactured by large-scale, small-scale and cottage-scale manufacturers and percentage not conforming to minimum standards.*

Products	Production over Rs. 1 lakh (Large-scale)			Production between Rs. 10,000 and 1 lakh (Small-scale)			Production below Rs. 10,000 (Cottage-scale)		
	Total No.	Not conforming	Percentage	Total No.	Not conforming	Percentage	Total No.	Not conforming	Percentage
Beverages	448	46	10	420	76	18	471	125	26
Canned fruits and vegetables	385	40	10	220	24	10	93	11	11
Jams, jellies and marmalades	425	61	14	261	33	13	265	30	11
Preserves	75	11	14	72	20	27	27	10	32
Chutneys	101	20	20	74	17	23	59	19	32
Tomato ketchup	107	71	66	101	62	61	65	34	53
Pickles	154	16	10	154	28	16	150	19	12
Vinegar	54	5	9	84	12	14	167	33	20
Sauces	3	..	..	17	2	12	12	2	17
TOTAL	1,752	270	15 (average)	1,383	272	20 (average)	1,218	283	21 (average)

Further, the State-wise examination of the reports of analysis of fruit products reveals that in the States of Punjab and Delhi as many as 26 to 27 per cent. of the samples did not conform to specifications while in case of Madras and Madhya Pradesh this figure was 20. In U.P., Bombay and West Bengal 15 to 16 per cent. samples did not conform to specifications. The States of Mysore and Travancore-Cochin showed satisfactory performance. Samples from Kashmir showed that as many as 17 per cent. of the samples did not conform while check samples of imported fruit products showed 8 per cent. of samples which did not conform to Fruit Products Order specifications.

TABLE VI.—*State-wise percentage of samples not conforming to specifications*

States	Number of factories	Total No. of samples	Samples not conforming	Percentage
Delhi	61	781	207	26
Uttar Pradesh	78	363	56	16
Punjab	79	147	40	27
Bombay	137	1,069	184	15
Madras	78	351	71	20
Madhya Pradesh	10	161	33	20
Mysore	18	194	12	6
Travancore-Cochin	7	41	1	2
West Bengal	81	1,226	185	15
Others	53	110	36	32
Kashmir	..	92	16	17
Foreign samples	..	340	28	8
TOTAL	602	4,891	869	18

Beverages

Beverages form an important group among the fruit products manufactured in India. This group comprises of the following products:

1. Squashes,
2. Crushes,
3. Cordials,
4. Barley waters,
5. Fruit juices and pulp,
6. Fruit syrups, and
7. Synthetic syrups.

The average annual production of beverages is estimated at 2,400 tons which is 20 per cent. of the total average production of fruit products in the country. Table VII shows the number of samples of different varieties of beverages examined and the number of samples which did not conform to specifications laid down in Parts II, III and IV of the Schedule to the Fruit Products Order, 1948. The fruit syrups had the highest percentage of samples which did not conform to specifications. This is followed by synthetic syrups, squashes, fruit juices, crushes, cordials and barley waters.

TABLE VII.—*Percentage of samples of various beverages which did not conform to minimum specifications under the Fruit Products Order.*

Sl. No.	Product	Number of samples examined	Number of samples not conforming	Percentage of samples not conforming
1	*Squashes*—	355	47	13·25
	Orange	179	26	14·5
	Lemon or lime	118	17	14·5
	Mango	25	3	12·0
	Pine-apple	16	Nil	Nil
	Others	17	1	6·0
2	*Fruit juices and pulp*	184	18	9·79
	Pine-apple	92	1	1·08
	Mango	38	5	13·1
	Orange	24	7	29·1
	Others	30	5	16·6
3	*Synthetic syrups*	449	90	20·04
	Rose	88	21	23·8
	Rasbery	41	10	25·0
	Orange	39	6	15·4
	Pomegranate	24	4	16·0
	Khas	24	5	20·0
	Sandal	16	7	43·7
	Almond	15	4	26·6
	Other	202	33	16·3
4	*Fruit syrups*	88	30	34·09
	Orange	14	1	7·1
	Almond	10	10	100·0
	Mixed fruit	12	7	58·3
	Pomegranate	8	3	37·5
	Pine-apple	6	1	16·6
	Others	38	8	21·0
5	*Crushes*	25	2	8·69
6	*Cordials*	53	4	7·55
7	*Barley waters*	16	1	6·25
	TOTAL	1,170	192	16·4

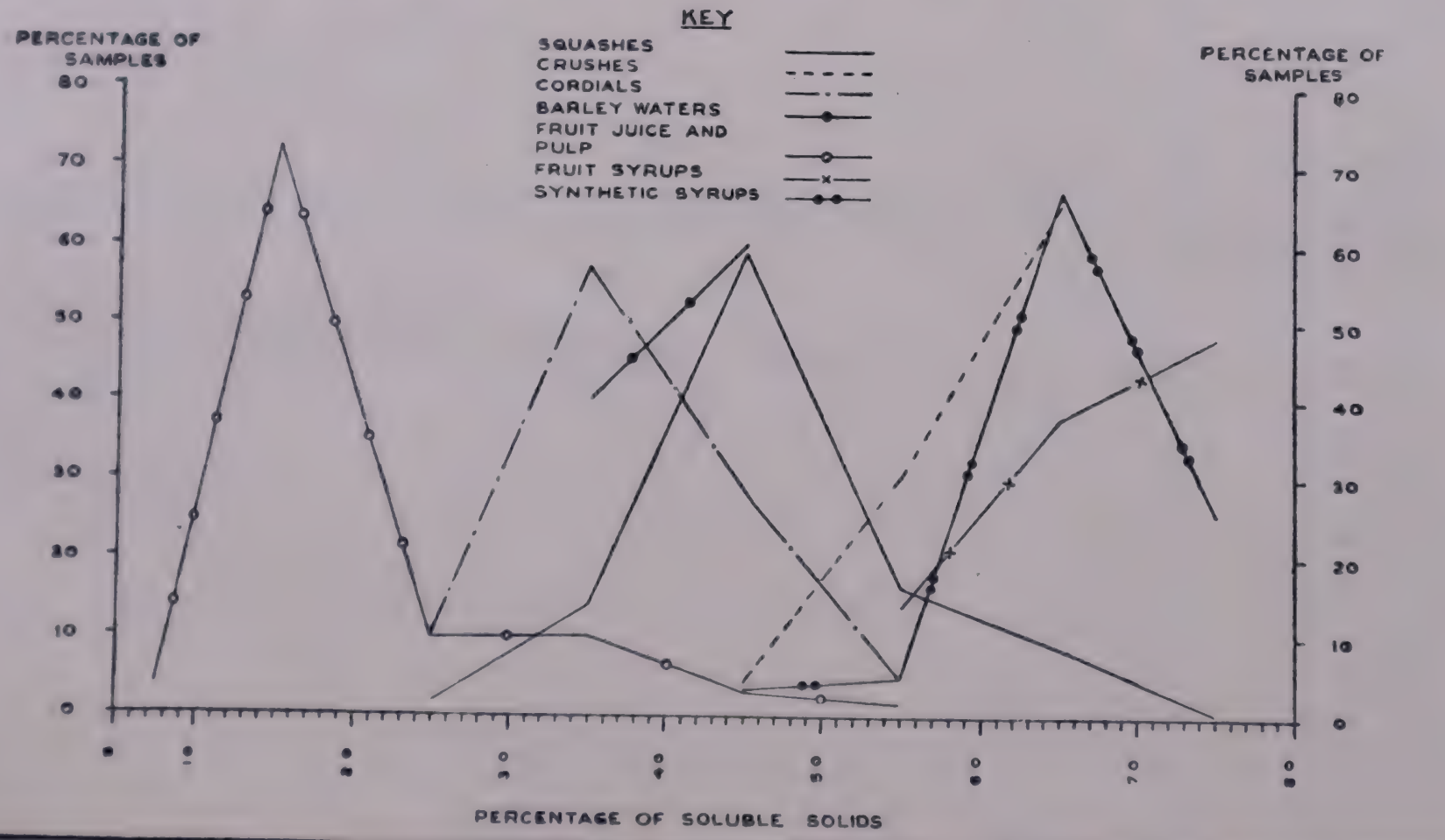
The State-wise performance given in Table VIII below shows that the samples collected from Mysore have shown better results than any other State. The samples collected from Punjab had as many as 30 per cent. of the samples which did not conform to specifications. In the States of Delhi and Madras the percentage of samples which did not conform to specifications was as high as 23 and 24 respectively while in U.P. and Madhya Pradesh these were 17 and 18 respectively. The performance of Bombay and West Bengal has been fair where the percentage of samples which did not conform to specifications was 15 and 14 respectively. The samples collected from the rest of the States showed poor standard.

TABLE VIII.—*Performance of samples of beverages from different states as well as different categories of manufacturers*

State	Categories of manufacturers	No. of samples	No. of samples not conforming	Total No. of samples per State	Total No. of samples per State not conforming	Percentage of samples not conforming
Delhi	LS	57	16	121	29	23
	SS	46	10	..	..	..
	CS	18	3	..	..	..
U. P.	LS	26	2	..	..	..
	SS	23	..	83	14	17
	CS	34	12	..	..	..
Punjab	LS	12	1	..	..	..
	SS	27	2	60	19	30
	CS	31	16	..	..	..
Bombay	LS	193	14	..	..	..
	SS	152	36	529	79	15
	CS	184	39	..	..	..
Madras	LS	..	..	..	..	..
	SS	37	6	109	27	24
	CS	72	21	..	..	..
Madhya Pradesh	LS	57	10	..	..	..
	SS	15	3	72	13	18
	CS	..	..	..	..	..
Mysore	LS	39	..	..	..	..
	SS	5	..	67	1	..
	CS	23	1	..	..	..
Travancore-Cochin	LS	5	..	..	..	..
	SS	1	..	8	..	..
	CS	2	..	..	..	..
West Bengal	LS	59	3	..	..	..
	SS	98	17	202	30	14
	CS	45	10	..	..	..
Others	LS	..	..	..	..	..
	SS	16	2	78	25	32
	CS	62	23	..	..	..
TOTAL	LS	448	46	..	..	..
	SS	420	76	1,339	247	20
	CS	471	125	..	..	..

[*Facing page* 9]

VARIATIONS IN THE PERCENTAGE OF SOLUBLE SOLIDS IN THE DIFFERENT VARIETIES OF BEVERAGES.



The quality of beverages was examined on the basis of (1) Percentage of soluble solids, (2) Percentage of acidity, (3) Quantity of preservatives, (4) Palatability and appearance, (5) Positive fermentation test, (6) Presence of unpermitted preservatives, and (7) Objectionable taints and flavours.

Although the minimum percentage of fruit juices in some of the products has been prescribed in the laboratory analysis, it has not been found practicable to find out the exact percentage of fruit juices used in the various products.

Percentage of total soluble solids.—Table IX shows the maximum percentage of samples in each category falling into the following percentages of soluble solids which is also indicated in Graph II facing this page.

	Percentage of soluble solids
Squashes	45
Crushes	65
Cordials	35
Barley waters	43
Fruit syrups	72
Fruit juices	15
Synthetic syrups	65

The above figures give a good indication that the manufacturers use correct proportion of sugar in their products and the consumer is being served with a product of uniform quality in all the groups mentioned above. The figures against each product are in line with the optimum requirement of sugar content in the various products and in almost all the cases these optimum figures have been observed in more than 50 per cent. of samples which conformed to specifications.

TABLE IX.—*Variations in the percentage of soluble solids in the different varieties of beverages*

Beverages percentage of samples	Percentage 5–10	Percentage 10–20	Percentage 20–30	Percentage 30–40	Percentage 40–50	Percentage 50–60	Percentage 60–70	Percentage 70–80
1. Squashes	..	..	1·62	13·97	59·09	16·24	8·76	0·32
2. Crushes	..	..	..	..	4·34	30·44	65·22	..
3. Cordials	..	..	10·21	57·15	28·57	4·07	..	..
4. Barley waters	..	..	..	40·10	60·00	..	..	..
5. Fruit juice and pulp.	3·60	72·1	9·9	10·0	3·0	1·5	..	..
6. Fruit syrups	..	..	..	..	..	13·8	37·93	48·27
7. Synthetic syrups	..	..	..	..	3·34	4·74	66·85	25·07

Table X shows the range of acidity in various beverages. The level of acidity in different classes of products was found to be well balanced and according to the consumer's requirements. It may be noted that in case of squash the acidity should preferably be kept above 1 per cent. against the soluble solids content of 40-45 per cent. This is also desirable from the point of view of preservation because the preservative will be more effective in higher acidity level than 1 per cent.

TABLE X.—*Variations in the percentage of acidity in different varieties of beverages*

Varieties	Percentage of acidity as citric acid			
	0–1·0	1·01–2·0	2·01–3·0	3·01–3·5
Squashes	25·97	50·26	16·25	5·52
Cordials	6·13	18·37	59·18	16·32
Barley waters	20·00	53·33	26·67	(minimum acidity prescribed is 2·5%).
Crushes	26·09	52·18	13·00	8·69
Pure fruit juices	66·91	25·19	0·71	Nil. (In 7·19% samples acidity was not determined.)
Fruit syrups	68·97	20·68	Nil.	Nil. (In 10·35 % samples acidity was not determined.)
Synthetic syrups	38·99	4·46	Nil.	Nil. (In 55·1% samples acidity was not determined.)

The remaining items for determining the quality of beverages have been tabulated in Table XI which indicates the defects found due to these factors in the samples which did not conform to specifications. In the case of squashes improvement should be made with regard to the correct dose of the permitted preservatives. Many manufacturers are adding preservative in approximate quantities. It is preferable to keep a constant weight of the lot which would avoid mistake in calculating the correct dose of the preservative. It is also necessary to weigh the preservative very carefully on a good bench balance and in the case of Potassium Metabisulphate the strength of the preservative should be ascertained prior to the calculation of the dose. Further, where combination of preservatives is to be used, the dose should be very carefully calculated as it is likely that the average dose of preservative may be more than the prescribed limit for Sulphur dioxide, *i.e.* 350 p.p.m. which will mean exceeding the permitted limits.

It has been noticed that in a large number of cases, particularly in synthetic syrups, the fermentation test has been found to be positive. This is more likely to occur if the conditions of hygiene and sanitation during the process of manufacture as well as washing of bottles is not carefully watched. The use of good quality cork and sealing material is also of utmost importance. It is, however, disturbing to note that even in higher percentage of sugar, as in synthetic syrups, there have been a large number of cases of fermentation. The Laboratory at Central Food Technological Research Institute, Mysore should investigate this aspect of the problem and see whether there is any peculiar strain of yeast which may have acclamatised to such high concentration of sugar to cause fermentation.

The presence of artificial sweetening agent and unpermitted preservatives is highly objectionable. Saccharin and salialic acid mainly were found to have been used. In many cases the manufacturers were ignorant of the fact that Fruit Products Order specifications do not permit their use. The manufacturers have been advised to discontinue this practice and have also been told what doses of permitted preservatives should be used.

Although there has not been report indicating use of inedible food colours, the manufacturers should bear in mind that in all fruit products edible colours be used because use of any other type of colour is harmful for human consumption. Same is true of metallic contamination from heavy metals like lead, arsenic, zinc or heavy dose of copper. It should be avoided by taking suitable care during the process of manufacture and by avoiding the use of any metals or chemicals which would lead to this type of contamination.

TABLE XI.—*Various defects found in different varieties of samples of beverages which did not conform to specifications*

	Squashes	Fruit crushes	Cordials	Barley waters	Fruit syrups	Synthetic syrups
1. No. of samples which did not conform	47	2	4	1	30	90
2. Excess of preservatives (350 p.p.m. SO_2 or 1000 p.p.m. S. Benzoate).	38	1	4	..	2	..
3. Not palatable or attractive .	12	..	2 (Same samples).	..	..	10
4. Fermented or with objectionable taints or flavours.	7	..	..	..	1	38
5. Presence of unpermitted preservatives or artificial sweetening agent.	2	(The second sample had excess of acidity.)	..	..	5 (28 samples were rejected on other grounds.)	48

The general make up has been quite good except for certain defects with regard to the variations in appearance, colour, low quality packing material and inconsistency of quality in the same brands. The manufacturers have not been taking advantage of the large quantities of fruit juice and pulp which is being added to their products and have not properly advertised the value of presence of juices in fruit beverages. Large number of consumers have not understood the difference between squashes, crushes, cordials, barley waters, fruit juices, fruit syrups and synthetic syrups. Many times fruit beverages have been consumed as ordinary beverages although the difference is quite apparent.

In meeting the general standard of quality, trend towards better packing has been noticed and it is a happy sign that large number of manufacturers have gone in for their own brand of bottles, for pilferproof packing and attractive labels. There is, however, need for standardization of quality by proper control of correct quantity of fruit juice, soluble solids, final acidity, matching of colour and flavouring material with standard packs.

Revised specifications

The specifications provided in the Schedule attached to the Fruit Products Order, 1948, have been recently revised. In the revised specifications following changes have been made :—

1. Minimum percentage of total soluble solids in the final product has been prescribed in case of individual items—for fruit syrups 65%, for crushes 55%, for squashes 40%, cordials 30%, unsweetened juice (natural), sweetened juice 10%, ready-to-serve beverages 10%;

2. Minimum percentage of fruit juice has also been prescribed for all types of beverages;

3. The combination of preservatives has continued to be allowed but when used in combination, the doses of the preservatives on an average should not exceed the limit prescribed for sulphur dioxide;

4. Lower dose of preservative has been prescribed for ready-to-serve beverages and the use of preservative has not been permitted in case of canned pulp or juice ;

5. Special provision has been made with regard to higher dose of preservative in fruit juice or pulp which are to be further processed and in concentrates;

6. In case of thick viscus juice, like mango, addition of water has been permitted if it is declared on the label;

7. In case of synthetic syrups and *sharbats* the minimum percentage of soluble solids has been prescribed at 65%; and

8. Exemption has been given with regard to labelling of *sharbats*. *Sharbats* may not be labelled as "synthetic" but at the same time such *sharbats* made out of rose, khus, kewra and sandal shall not bear pictures of fruits on the labels.

Canned Fruits and Vegetables

The manufacture of canned fruits and vegetables is of recent origin in India. It can be termed as the youngest industry connected with the fruit preservation. The World War II gave a fillip to the industry and as a result large quantities of canned fruits and vegetables have been manufactured during and after the War. The average annual production of canned fruits and vegetables has been 1,120 tons and 1,150 tons, respectively.

Table XII shows the samples of canned fruits and vegetables products which did not conform to specifications laid down in Part V of the Schedule to the Fruit Products Order, 1948. The abnormal defects have been found in the case of canned strawberries, tomatoes, apricots and other fruits which are not normally canned. The main fruits which are being canned extensively, *i.e.*, mango and pine-apple, have shown less degree of non-conformity with the minimum standard but the figure should further improve. In canned peas 13 per cent. of samples did not conform to specifications, which is not very encouraging as this is the only vegetable which has the consumers' acceptance and production of which is increasing from year to year, having good prospects.

TABLE XII.—*Percentage of samples of different varieties of canned fruits and vegetables which did not conform to Fruit Products Order specifications.*

Sl. No.	Products	No. of samples examined	No. of samples not conforming	Percentage
	Canned fruits—			
1.	Pine-apple	220	11	5·0
2.	Mango	81	3	3·75
3.	Peaches	82	11	13·4
4.	Pears	82	6	7·3
5.	Fruit cocktail and salad	67	1	1·5
6.	Cherries	35	2	5·7
7.	Apricots	21	6	29·0
8.	Oranges	16	2	12·5
9.	Strawberries	14	12	85·7
10.	Others	36	12	33·3
	TOTAL	654	66	10·03
	Canned vegetables—			
11.	Peas	148	19	12·9
12.	Tomatoes	17	7	41·9
13.	Others	68	9	12·9
	TOTAL	233	35	15·06
	GRAND TOTAL	887	101	11·2

The State-wise performance can be judged from Table XIII. The samples from Travancore-Cochin and Mysore showed a very satisfactory position followed by Madhya Pradesh. In Madras, Delhi and U.P. 12 to 13 per cent. samples did not conform to specifications while in Bombay this figure was 14. In case of West Bengal the percentage of samples which did not conform to specifications was 16·8.

TABLE XIII.—*Performance of samples of canned fruits and vegetables from different states as well as different categories of manufacturers.*

Name of the State	Categories of manufacturers	No. of samples	No. of samples not conforming	Total No. of samples per State	Total No. of samples per State not conforming	Percentage of samples not conforming
Delhi	LS	70	6	..	..	..
	SS	72	8	156	21	13
	CS	14	7	..	..	..
U. P.	LS	55	7	..	..	..
	SS	13	1	74	10	13
	CS	6	2	..	..	..
Punjab	LS	..	..	..	..	..
	SS	..	..	1	..	..
	CS	1	..	..	..	..
Bombay	LS	111	13	..	..	..
	SS	17	6	136	20	14
	CS	8	1	..	..	..
Madras	LS	..	..	..	..	..
	SS	36	5	49	6	12
	CS	13	1	..	..	..
Madhya Pradesh	LS	20	1	..	..	..
	SS	..	..	20	1	5
	CS	..	..	..	..	..
Mysore	LS	9	..	..	..	..
	SS	..	..	20	..	..
	CS	11	..	..	..	..
Travancore-Cochin	LS	10	1	..	..	..
	SS	18	..	42	1	..
	CS	14	..	..	..	..
West Bengal	LS	110	12	..	..	..
	SS	64	4	196	16	16·8
	CS	22	..	..	..	..
Others	LS	..	..	..	..	..
	SS	..	..	4	..	..
	CS	4	..	..	..	..
TOTAL	LS	385	40	..	..	..
	SS	220	24	698	75	..
	CS	93	11	..	..	..

The various defects found in samples of canned fruits and vegetables which did not conform to specifications are shown in Table XIV.

TABLE XIV.—*Percentage of various defects amongst the samples of canned fruits and vegetables which did not conform to specifications.*

Sl. No.	Defect	Fruits 66 samples	Percentage	Vegetables 35 samples	Percentage
1.	Low drained weight	37	56	22	62
2.	Not attractive	38	57	13	38
3.	Swollen cans	24	36	6	17
4.	Meshed up	9	13	9	26
5.	Not palatable	9	13	12	34
6.	Objectionable colour	3	4	..	..
7.	Spoiled cans	2	3	5	14
8.	Preparation not good	1	15	3	8

1. *Low drained weight.*—The main defect among the samples which did not conform to specifications has been low drained weight. The minimum specifications provide for 40 per cent. of drained weight in case of fruits and 50 per cent. in case of vegetables. There should not be any practical difficulty in conforming to these minimum specifications except perhaps in the case of strawberries and litches in fruits and tomatoes in vegetables.

Table XV shows samples of canned fruits and vegetables which conformed to specifications in relation to different ranges of drained weight. More than 73 per cent. of the samples in case of canned fruits had drained weight higher than 50 per cent. and in case of canned vegetables, although figure for above 55 per cent. drained weight is not available, a large number of samples had higher drained weight than 55 per cent. It has been proposed to increase the minimum standards with regard to drained weight from 40 and 50 per cent. for fruits and vegetables to 50 and 55 per cent. respectively. To ensure that there is no difficulty in conforming to these minimum requirements of drained weight, exceptions have been made for strawberries, rasberries and tomatoes, where lower drained weights have been prescribed.

TABLE XV.—*Variations in drained weight of canned fruits and vegetables which conformed to specifications.*

Sl. No.	Fruit	40–50 Per cent.	51–60 Per cent.	61–70 Per cent.	71–80 Per cent.	81–90 Per cent.	Total
Canned Fruits (588 *samples*)—							
1.	Pine-apples	68	108	32	1	..	209
2.	Mangoes	14	27	28	9	..	7
3.	Pears	11	37	21	7	..	76
4.	Apricots	4	11	..	..	..	15

TABLE XV—*contd.*

Sl. No.	Fruit	40–50 Per cent.	51–60 Per cent.	61–70 Per cent.	71–80 Per cent.	81–90 Per cent.	Total
5.	Cherries . .	11	12	9	1	..	33
6.	Oranges . .	5	6	3	..	..	14
7.	Peaches . .	17	35	16	3	..	71
8.	Fruit cocktail or salad.	17	35	11	3	..	66
9.	Others . .	15	4	6	1	..	26
	TOTAL .	162	275	126	25	..	588
	PERCENTAGE .	27	45	20	8	..	100
Canned vegetables (180 *samples*)—							
10.	Peas . .	..	66	56	6	1	129
11.	Tomatoes .	5	2	1	2	..	10
12.	Others . .	..	25	13	2	1	41
	TOTAL .	5	93	70	10	2	180
	PERCENTAGE .	2·5	51	44	5	..	100

2. *Not attractive.*—The palatability of the product has an important bearing on its appearance, colour and preparation, and it is, therefore, necessary that adequate attention is paid to proper selection of raw material and proper preparation prior to canning. It has been noticed that in case of pine-apple in large number of samples the product was not properly trimmed to remove the eyes and was not uniformally cut, sliced or cored. In case of mangoes it has been noticed that manufacturers have used more than one variety of fruits in the same can and in certain cases have used varieties which are not suitable for the purpose of canning, which has resulted into a meshy product. According to the Army Supply Corps Specifications the only varieties which are suitable for canning are Alfanso, Benganphali, Dasseri, Fazli, Totapuri and Safeda. It is also desirable that the manufacturers should indicate the kind and variety of the product used on the label. In the selection of the raw material the major complaint has been with regard to processed peas which have been found to be either meshed up or too hard for consumers' acceptance.

3. *Spoiled cans.*—Although the percentage of samples which have shown spoilage is not very alarming in case of fruits, the percentage in case of vegetables needs improvement. Table XVI shows the performance of canned fruits and vegetables supplied to the Chief Director of Purchase.

TABLE XVI.—*Percentage of Spoilage observed in Canned Fruits and Vegetables in supplies made to the Chief Director of Purchase in different years.*

Year	Fruits		Vegetables	
	Quantity supplied (in tons)	Spoiled (in tons)	Quantity supplied (in tons)	Spoiled (in tons)
1949-50	426	1¼	571½	2
1950-51	749	3¾	2,843	31¼
1951-52	415	½	1,043½	11
1952-53	432½	4	1,185¼	6

It is found during inspections of factories that adequate record of processing, time and temperature are not kept. It is necessary to keep a record of every batch, which is processed and the time and temperature should be invariably noted down. In case of processing of fruits in hot water, the temperature of the water should be maintained and should be recorded. In case of steam processing of fruits, it is important to note the processing time. There is, further a tendency of over-processing of fruits and sometimes even vegetables, which is objectionable from the point of view of quality of the finished products. In processing of vegetables many canners control processing with the help of pressure gauges only which many times may give false indication. The pressure gauges are likely to give incorrect indication and in many cases may not be equivalent to the corresponding temperatures. It is, therefore, advisable that the processing should be checked by thermometers as well as by pressure gauges but if this is not practicable at least the pressure gauges should be equated with temperatures at least once a week during the processing season.

The manufacturers should further equip themselves with two incubators, one with a range of temperature 37°C and another with a range of temperature 55°C. The canned fruits should be incubated a 37°C for a period of seven days as provided in the revised specifications while canned vegetables should be incubated at both temperatures for a period of seven days. This will ensure freedom from spoilage. These adequately processed lots can be seggregated. This will help in checking of defects in production and act as an insurance against bad quality.

4. *Swollen cans.*—From amongst the samples which did not conform to specifications, a large number of cans showed positive pressure. Table XVII shows the percentage of samples which fall into different categories of positive pressure, zero vacuum, 1-6″ vacuum and vacuum above 6″ in case of canned fruits. For the purpose of ensuring adequate shelf life of the products as well as marketing of these products at higher altitudes, it is necessary that the cans have vacuum of not lower than 6″ or preferably of 8″. This can be achieved by keeping close check on the *ex*-exhaust temperature. At least the minimum temperature of 150°C should be attained at the centre of the can while closing. The use of hot syrup or brine would quicken the rise in temperature and would ensure a good vacuum in the can.

TABLE XVII.—*Variations in pressure and vacuum in case of samples canned fruits which conformed to specifications.*

Total number of samples which conformed *cans only*	588
1. Percentage of cans which contained pressure although apparently looked sound	18·70%
2. Percentage of cans which contained zero vacuum	14·58%
3. Percentage of cans which contained 1″–6″ vacuum	36·02%
4. Percentage of cans which contained vacuum above 6″	30·70%
TOTAL	100·00

Soluble solids in syrups of canned fruits.—The soluble solids content in the drained liquid is an important factor in quality control. It will, therefore, be interesting to see how the samples have behaved in respect of the soluble solids contents in the drained liquid. Table XVIII shows the percentage of samples against different ranges of soluble solids. It will be observed that 30 per cent. of the samples had less than 20 per cent. Brix in the covering liquid. It is desirable that the percentage of soluble solids should not be below 19 per cent. and hence it will be better if the manufacturers use higher strength of syrup in their products. In an exceptional case lower percentage of sugar may be advantageous but in that case it should be properly described on the label that the product is canned in a very low sugar medium.

TABLE XVIII.—*Range of total soluble solids in the syrup of canned fruits* (588 *samples*).

Degrees/Brix	Percentage
13–20	30·27
21–25	48·13
26–30	16·33
31–35	2·89
36–40	0·34
41–50	0·85
51–60	0·68
61–70	0·34
71–73	0·17
TOTAL	100·00

Labelling.—It is necessary that adequate attention is paid to the design and get-up of the label as well as the description of the product given on the label. A large number of the samples did not give detailed information to the consumer and in many instances the same labels are used for a variety of products. The consumer is interested to know the details with regard to the number of servings, the drained weight, the variety of fruit or vegetable used, the size of the pieces, if possible and the manner of serving the product. It will be a great help if this information is indicated on the labels.

In some of the samples wrong claims have been made with regard to the product, which is detrimental in the long run. This particularly applies to processed peas which have been described in many instances as "green peas".

Most of the large-scale fruit products manufacturers engaged in the manufacture of canned fruits and vegetables have adequate equipment and machinery for handling both fruits and vegetables. The standard of quality of products, on an average, has been well maintained and in most of the factories the standard of hygiene and sanitation has been found satisfactory. There is, however, not adequate control on the quality of the raw material used. Most of the manufacturers are buying their requirements from the local markets and little or no attention is being paid to the maturity or sound quality of fruits and vegetables. In certain cases even the variety used in the manufacture is inconsistent, although in the case of certain fruits like pine-apple, mango and orange, the variety used is recognised and insisted upon. Handling of fruits and vegetables can be further improved particularly from the point of view of shortening the time of packing the material after it has been received in the cannery. The washing of fruits and vegetables is many times not properly looked after and in preparation the losses due to peeling and triming are not properly controlled although unlike many other processes, there is a fairly good inspection at this stage. The style of packing is also important in many fruits and vegetables. It is noticed that many times slicing and cutting is not uniform and the product is not properly styled to give uniform appearance. Weight filling is a varying factor and should be worked out in case of every fruit and vegetable to give required final weight for different can size. Thorough washing of cans prior to filling should be a must, as in many cases the cans are stored improperly and would be a source of contamination and trouble. The mechanical aspect of canning is many times not well attended to. Most of the canners have not been checking seaming machines regularly and do not check the seams of cans by testing them properly under pressure. It is necessary to have proper testing equipment so that the seam is properly tested prior to use as all the effort which goes into canning is nullified if proper seaming is not executed.

A word may be said with regard to small manufacturers who are handling a fairly good quantity of canned fruits and vegetables particularly canned peas. The hygienic conditions of manufacturers should be fairly improved. At processing stage the load of one or two retorts is rather excessive and in most of the cases the time lag between seaming and processing is dangerously too long. The arrangement of processing is also far from satisfactory as it takes nearly 3 to 5 hours for one load of canned vegetables to be properly processed as the time for proper temperature on furnaces is rather long. Further, there is no arrangement for proper cooling of cans and in most of the cases there is danger of stack burning. While it is possible for the small manufacturers to put up a good product, it is necessary to bear in mind the limitations from the point of view of output and they should not step beyond the reasonable number of cans which they can satisfactorily handle. In large number of cases spoilage can be traced to over-production because under such conditions there is hardly any control feasible at any stage of production.

Revised specifications

The specifications for canned fruits and vegetables have been considerably changed. The changes made are as under:

1. The drained weight has been increased to 50 per cent. in case of fruits and 55 per cent. in case of vegetables from 40 and 50 per cent. respectively;

2. There shall not be any positive pressure in the can at sea-level;

3. Incubation has been prescribed for one week at 37°C in case of fruits and 37°C and 55°C in case of vegetables;

4. Use of artificial food colour has been allowed only in the case of cherries, strawberries, green peas and processed peas; and

5. In the case of processed peas or any product made from dried or otherwise processed material, the product has to be described as "prepared from dried material".

Jams, Jellies and Marmalades

On an average, production of jams, jellies and marmalades has been 500 tons per year. There is scope for increased production of these items because a large number of small manufacturers are preparing varieties of these products and marketing them locally at a very competitive prices. Availability of fruits in good quantity of suitable varieties which can be processed into jams, jellies and marmalades is a limitation. Only a limited quantity of strawberry, raspberry, peach, apricot, plum, apple and a suitable variety of oranges for marmalade are available for manufacture of these products. It is perhaps better to evolve suitable quality products from indigenous fruits like mangoes, guavas, wood apples and mandarine type of oranges than to market all varieties of products.

Table XIX shows the percentage of samples of jams, jellies and marmalades which did not conform to specifications laid down in Parts VI and VII of the Fruit Products Order, 1948. It will be seen that in particular jams like mango, apple, peach, pear, cherries, there is great need for improvement. In the case of orange marmalade the percentage of samples which have not conformed is rather alarming.

TABLE XIX.—*Percentage of samples of varieties of jams, jellies and marmalades which did not conform to Fruit Products Order, 1948, specifications.*

Sl. No.	Product	Total samples	Samples not conforming	Percentage
1	2	3	4	5
Jams—				
1.	Mixed fruits	84	8	9·5
2.	Apricot	79	11	13·9
3.	Strawberry	78	4	5·0
4.	Raspberry	70	1	1·3

TABLE XIX—*contd.*

1	2	3	4	5
5. Gooseberry		57	1	1·7
6. Plums		56	9	16·0
7. Pine-apple		54	3	5·5
8. Mango		43	14	30·0
9. Apple		38	11	28·0
10. Peach		29	8	27·0
11. Orange		17	2	11·0
12. Pear		15	2	13·0
13. Cherries		15	5	33·0
14. Others		27	8	30·0
	TOTAL	662	86	12·99
Jellies—				
15. Guavas		176	13	7·3
16. Apples		21	2	9·0
17. Others		66	6	9·0
	TOTAL	263	21	7·98
Marmalades—				
18. Orange		157	45	28·0
19. Others		9	2	22·0
	TOTAL	166	47	28·31
	GRAND TOTAL	1,091	154	14·1

The State-wise performance detailed in Table XX shows that in Delhi as many as 19 per cent. samples did not conform to specifications. Madras had as many as 18 per cent. samples which did not conform to specifications while Madhya Pradesh, U.P., West Bengal and Bombay had 13, 12, 11 and 12 per cent. of samples respectively. Mysore showed only 8 per cent.

TABLE XX.—*Performance of samples of jams, jellies and marmalades from different states as well as different categories of manufacturers.*

State	Categories of manufacturers	No. of samples	No. of samples not conforming	Total No. of samples per state	Total No. of samples per state not conforming	Percentage of samples not conforming
1	2	3	4	5	6	7
Delhi	LS	71	14	..	..	..
	SS	71	14	159	30	19
	CS	17	2	..	..	..
U. P.	LS	76	9	..	..	..
	SS	31	4	132	16	12
	CS	25	3	..	..	..
Punjab	LS	2	1	..	..	..
	SS	3	1	8	3	..
	CS	3	1	..	..	..

TABLE XX—*contd.*

1	2	3	4	5	6	7
Bombay . . .	LS	84	7	..	..	..
	SS	46	3	166	18	10
	CS	36	8		..	..
Madras . . .	LS	..	..	..	..	..
	SS	20	3	38	7	18
	CS	18	4	..	..	..
Madhya Pradesh .	LS	38	4	..	..	..
	SS	1	1	39	5	13
	CS	..	..	..	..	..
Mysore . . .	LS	20	2	..	..	..
	SS	1	..	56	5	8
	CS	35	3	..	..	..
Travancore-Cochin .	LS	1	..	..	..	..
	SS	..	..	..	..	..
	CS	..	..	1	..	..
West Bengal . .	LS	133	24	..	..	..
	SS	64	7	321	38	11
	CS	124	7	..	..	..
Others . . .	LS	..	..	..	..	..
	SS	4	..	11	2	18
	CS	7	2	..	..	..
TOTAL .	LS	425	61	..	..	..
	SS	241	33	931	124	..
	CS	265	30	..	..	..

Table XXI shows the various defects found in the samples of jams, jellies and marmalades. Low soluble solids content, swollen cans and inconsistency of the product claimed the largest percentage in the case of jams while in the case of jellies, mould growth, objectionable taste and flavour, unattractiveness and inconsistency of the product claimed the largest number of samples. In the case of marmalades most of the samples did not have adequate quantity of peel in the product.

TABLE XXI.—*Percentage of various defects found in jams, jellies and marmalades in samples which did not conform to specifications.*

Sl. No.	Defects	Jams (86 samples)	Percentage	Jellies (21 samples)	Percentage	Marmalades (47 samples)	Percentage
1.	Low soluble solids . . .	53	61	1	4·7	3	6·4
2.	Not well set	21	24	5	23·0	7	15
3.	Swollen cans	50	58	2	9	6	13
4.	Not attractive	14	16	9	32	4	8
5.	Taste and flavour objectionable .	13	15	6	27	1	2
6.	Positive fermentation . .	9	10	8	36	1	2
7.	Excess of SO_2 . . .	7	8	2	9	6	13
8.	Thickening agent . . .	10	11	1	4·7	Nil	..
9.	Sugar crystallization . .	3	3·4	3	13	Nil	..
10.	Mould growth . . .	1	1·1	7	33	1	2
11.	Foreign matter . . .	1	1·1	Nil.	..	1	2
12.	Added peel less than the prescribed limit.	..	..	..	..	32	70
	TOTAL .	86		21		47	

Low soluble solids.—It will be observed that this defect is responsible for as many as 61 per cent. of samples which failed to conform to specifications. This has a direct bearing on the laxity of control at the production stage. The lots after being manufactured are not checked in respect of the percentage of the soluble solids. Even at the finishing stage if the soluble solids content is checked by means of temperature control, there seems to be lack of such control even in the samples which conformed to specifications. Variation in the soluble solids content, as will be seen from Table XXII, is very striking.

TABLE XXII.—*Variations in soluble solids in samples of jams, jellies and marmalades which conformed to Fruit Products Order,* 1948 *specifications.*

	Jams (576 samples)	Jellies (242 samples)	Marmalades (119 samples)
65–70	56·94	33·06	43·7
71–82	43·08	66·94	56·3

It is, however, interesting to note that on an average more than 50 per cent. of the samples which conformed to specifications had soluble solids over 70 per cent. This not only gives a product of unstandard quality but also results in decreased yield for the manufacturer. The defects due to crystallization are an off-shoot of higher concentration of sugar and low acidity. This can be easily avoided by proper control.

Often, products belonging to the same manufacturer have shown varying degrees of percentages of soluble solids. It is suggested that both in the control of minimum percentage of soluble solids as well as in the control of uniformity of soluble solids from lot to lot the manufacturer should either use a temperature control or refractometer to check the finished product. In the case of these products the minimum percentage of soluble solids can be attained by bringing their boiling points in the case of these products to 221°F at sea level. Of course, the use of pocket refractometer is strongly recommended as this instrument will be useful in checking various other products.

Setting of the product.—The consumer not only demands a correct sugar acid ratio and the minimum percentage of fruit juice or pulp with a natural flavour of the fruit but also desires that the product should be of uniform setting having a jelly-like consistency. In a large number of cases the manufacturers failed to obtain a good set. Even in the products which conformed to specifications, the setting has been rather varying. In case of jams, in large number of varieties, the manufacturers will have to use added pectin to obtain good setting. The use of pectin, however, should be carefully controlled by checking the strength of pectin which may vary from 150 to 250 grade. The grade of pectin is determined by ability of one pound of pectin to set corresponding pounds of sugar, *i.e.*, 150 grade means one pound of pectin will set 150 pounds of sugar. In the case of jellies and marmalades more attention is required to be paid to the extraction of pectin and whenever there is variation in the pectin content of the extract, the quantity of added sugar should be judiciously

altered to obtain a uniform setting in the final product. In many cases the pH will play an important part in the final setting of the product. Most of the manufacturers have no facilities for checking the percentage of acidity and hence in many cases proper results may not have been obtained either because of low acid or excess of it. The manufacturers should have some form of control on acidity in the product. Although it is most desirable to have pH control, if this is not practicable, at least, check should be maintained on percentage of acidity.

Swollen cans.—A large number of cans have shown positive pressure on examination. This has in many cases been due to hydrogen swell which may have been caused due to long storage at high temperatures. In many cases this may have occurred due to cold filling of jams which may not have given adequate vacuum to begin with. Over-filling of containers also results in swollen cans.

Appearance and taste.—The appearance of the product is an important factor from the point of view of the consumer. In the case of jellies this defect has claimed a higher percentage. The darkening of jellies after certain period of storage is a problem where the laboratory can give some useful indication after experimentation. It is suggested that cooling of the product and better storage on the shelf would definitely give a better appearance to the product for a longer time.

In some of the reports it was found that the excessive quantities of flavouring materials have been used by the manufacturers. In the case of jellies some samples which were examined had different descriptions like "mango", "orange" and "pine-apple jelly" but they seemed to be made of the same guava extract differently coloured and flavoured. Some other similar samples have also been analysed where the product was made of sugar and pectin with artificial colour and flavour. These products should be suitably described and according to the amended Fruit Products Order, they should be called "synthetic jellies".

Fermentation and mould growth.—This defect is again mainly manifested in the jellies. It has been found that various types of non-standardized containers have been used in packing jams and particularly jellies. Many times second-hand containers have been used. It is also likely that the manufacturers have not been attending to proper cleaning and drying of containers prior to use. Besides the containers, lids and caps should also be cleaned prior to use as this may be a source of contamination.

Wherever possible, it is advisable to process jams for a few minutes either in boiling water or in open seams. In case of cans, soon after the closing of the lid, the product should be inverted so that the fresh lid is sterilised due to the temperature of the product. At present most of the manufacturers are using paraffin covering on bottled products which many times is inadequate and leads to mould growth as well as fermentation. Better types of closers are now available and the manufacturers should try to change-over to better method of packing.

Thickening Agent.—Agar-agar, gelatin, sodium algaenate and other thickening agents are not permitted in the manufacture of jams, jellies and marmalades. The natural source of pectin from various fruits should only be relied upon for obtaining proper set.

Added peel and marmalade.—This defect in marmalade is more due to the distribution of peels from sample to sample. From a practical point of view the variation is bound to occur. The specifications for marmalades have been suitably amended.

The major complaint against the manufacturers is inconsistency in quality. There has not been any attempt to standardise the firmness of the set, colour, sugar-acid ratio and the get up of the product. It is many times observed that there is hardly any difference in taste between one type of jam and the other. The variation should, therefore, be properly worked out with regard to the quantity of fruit, flavour and acidity. The use of different types of colours should also be properly studied with respect to the fruit and darkening of these colours during storage should be taken into consideration.

There is lack of adequate know-how on the part of the manufacturers for processing of varieties of jams. The attempt to market substitutes and imitations without proper labelling does undoubtedly shake the confidence of the consumer.

Revised specifications

The revised specifications for these products have made important changes as under:—

1. Fruit cheese has also been included in specifications for jams ;

2. The minimum percentage of fruit has been prescribed at 45 in the case of jams, juice, jellies and marmalades except in the case of raspberry and strawberry jams where it can be 25;

3. The minimum percentage of soluble solids has been raised to 68 per cent. in the case of jams;

4. Use of sodium benzoate up to 200 p.p.m. has been permitted;

5. If the product is packed in cans, it should not show any positive pressure at sea level;

6. When dried fruit is used, it should be clearly declared on the lable ; and

7. In the case of jelly made from sugar and chemical pectin, it shall be declared as "synthetic jelly".

Chutney

Chutney has a unique importance amongst the fruit products manufactured in India. Indian chutneys have been popular in foreign countries since a century. Many of the manufacturers associated with this trade have long and reputable standing in foreign markets. At present the trade is centred at Bombay and Calcutta. If the markets are expanded in this commodity, mango growing regions in the country can suitably take up the manufacture of chutney. Although a good market exists for export of mango chutney, there is an unexplained

lacuna of practically no demand for this product within the country. At present the average production of chutney has been estimated at 700 tons per year but if a taste is cultivated for this product, there is a good scope for developing this industry on a large scale.

Table XXIII shows the samples of chutney which did not conform to specifications prescribed in Part X of the Schedule to the Fruit Products Order, 1948. It is disturbing to see that as many as 25 per cent. of the samples did not conform to specifications. In the revised Fruit Products Order specifications this factor has been taken into consideration and the soluble solids content has been reduced from the present level of 60 per cent. to 50 per cent. while the limits for yeast, spores and bacteria have been dropped keeping only mould count as a check against the quality of the raw material.

TABLE XXIII.—*Percentage of samples of chutney which did not conform to Fruit Products Order, 1948 specifications.*

Sl. No.	Product	Total No. of samples	Samples not conforming	Percentage
1.	Mango chutney	147	32	21·7
2.	Other types	74	24	32·4
	TOTAL	221	56	24·45

The performance by various States is shown in Table XXIV. The important producing areas for chutney are West Bengal, Bombay, and Madras where the percentages of samples which did not conform to specifications were 20, 30 and 41 respectively.

TABLE XXIV.—*Performance of samples of chutney from different states as well as different categories of manufacturers.*

State	Categories of manufacturers	No. of samples	No. of samples not conforming	Total No. of samples per state	Total No. of samples per state not conforming	Percentage of samples not conforming
1	2	3	4	5	6	7
Delhi	LS	7	1	..	..	..
	SS	6	1	15	2	13
	CS	2	..	..	..	..
Uttar Pradesh	LS	..	..	..	..	..
	SS	4	1	6	3	50
	CS	6	2	..	..	..

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TABLE XXIV—*contd.*

1	2	3	4	5	6	7
Punjab	LS	1	..	..	..	..
	SS	..	..	..	..	..
	CS	3	..	..	..	..
Bombay	LS	23	7	..	..	..
	SS	5	..	37	11	36
	CS	9	4	..	..	..
Madras	LS	..	..	..	..	..
	SS	26	10	31	13	41
	CS	5	3	..	..	..
Madhya Pradesh	LS	2	..	..	..	..
	SS	..	..	2	..	..
	CS	..	..	..	..	..
Mysore	LS	..	..	..	..	..
	SS	11	2	20	4	20
	CS	9	2	..	..	..
West Bengal	LS	68	12	..	..	..
	SS	22	3	114	22	20
	CS	24	7	..	..	..
Others	LS	..	..	..	..	..
	SS	..	..	1	1	..
	CS	1	1	..	..	..
TOTAL	LS	101	20	..	..	..
	SS	74	17	234	56	..
	CS	59	19	..	..	..

Table XXV shows the various defects found in the samples which did not conform to specifications. The defects like low soluble solids content and excess of microbio-load have claimed largest number of samples which did not conform to specifications.

TABLE XXV.—*Percentage of defects in samples of chutney which did not conform to specifications.*

Defects	Number of samples (56 samples)	Minimum required	Percentage
1. Low soluble solids	29	60 per cent.	51
2. Excess of yeast and spore count	11	Over 125 per 1/60 c.c.m.	20
3. Excess of mould count	10	40% of the field examined.	19
4. Excess of bacterial count	6	Not in excess of 100 million per c.c.	10
5. Positive fermentation test	2	..	3·5
6. Presence of preservative	2	Over 250 p.p.m. of SO_2.	3·5

1. *Low soluble solids.*—This aspect has been discussed above. Some of the manufacturers had contracts with importers to supply mango chutney having low soluble solids content. These specifications require soluble solids content up to 50 per cent. or slightly above. Keeping to this stipulation manufacturers have avoided the use of the minimum quantity of sugar required under the specifications of Fruit Products Order, 1948.

Table XXVI shows the different ranges of total soluble solids found in the samples which conformed to specifications. It will be observed that nearly 38 per cent. samples showed soluble solids content over 66 per cent. which perhaps could have been avoided by proper checking of percentage of soluble solids at the finished product stage.

TABLE XXVI—*Variations of percentage of soluble solids in samples of chutney which conformed to specifications.*

Per cent. soluble solids	165 samples
1. 60–65	59·28%
2. 66–70	30·54%
3. 71–75	7·19%
4. 76–80	2·39%
5. 80–85	0·60%
TOTAL	100·00

2. *Excess of microbio-load.*—The mould, yeast, spores and bacterial counts have claimed 50 per cent. of the samples which did not conform to specifications. This reflects on the quality of the raw material as well as on the conditions of manufacture. It is a warning to the manufacturers that if the standards of hygiene and sanitation are not improved during the preparation and process of manufacture, the finished products are bound to show signs of excessive microbio-load. The revised specifications have provided mould count as a check on the quality of the raw material and it is suggested that the manufacturers should take extra care in checking the quality of the mango slices in brine as well as other ingredients used in the manufacture of mango chutney. It is important, therefore, that the mould growth is not permitted during the long period of storage of mango slices in brine in casks. There should also be proper cleaning of mango slices in brine prior to their use.

The process of manufacture of chutney is not uniform and the manufacturers have introduced their own variations in the manufacture. The standardization of process does not mean that the different recipes followed by the various manufacturers for the respective brands needs to be changed. The standardization of process will bring more uniformity of the product in the salient features which are provided basically under the minimum specifications. This will augur well for future expansion of the trade.

The manufacturers do not control the quality of mango slices in brine, which in many cases are not processed by the chutney manufacturers. The trade of pickling of mango slices is scattered in the various mango growing regions. This is an unorganised industry and has neither the understanding nor the knowledge of any quality control with respect to the product being handled. The conditions of handling and processing at this stage are bound to be unstandardised and unsatisfactory but with the co-operation of chutney manufacturers and initiation by them the conditions may improve. The existing cottage scale industry of preserving the mango slices in brine can be organised and put on hygienic and sanitary footing if proper direction is given and some control is exercised by the chutney manufacturers. They should organise supervision of peeling, slicing, salting, barreling and pickling. At present the chutney manufacturers seem to visit these centres only for collection of processed material.

There is further need for the manufacturers to pay attention to the proper selection of the raw material and grading of the same at the first stage of manufacture so that the quality of the finished product may be controlled during the subsequent stage of manufacture. For instance, the raw mango slices can be graded with respect to colour and texture. It is possible to use uniform variety of fruit for particular lots or, if this is not practicable, it may be possible to use the fruit of particular ripeness depending upon acidity. There is also possibility of introducing grading if the mango slices in brine are prepared in the premises of the chutney manufacturers.

The mango slices in brine are stored for varying number of months prior to their final use. The storage is not properly attended to and in many instances the condition of storage may be responsible for lowering the quality of the finished product.

The spices, dry fruits or other material added to the chutney should be properly cleaned and should be of very good quality. The use of vinegar during the process of boiling attacks the tinned utensils generally used by the manufacturers. In most of the cases the tinned utensils have to be tinned at an interval of two or three days. It is suggested that wherever possible these utensils should be replaced by stainless steel utensils.

Revised specifications

Some important changes have been made in the revised specifications for chutneys. These are:

1. The chutney shall have 40 per cent. of fruit in the finished product;

2. The minimum percentage of total soluble solids shall be 50 per cent.;

3. The chutney will conform to the prescribed mould counts only instead of mould, yeast, spores and bacterial counts; and

4. In mango chutney if any fruit in excess of 5 per cent. of the total fruit is used, the name of the fruit should be declared on the label.

Preserves

The manufacture of preserves or *murrabbas* has been known to indigenous manufacturers for centuries. These products manufactured in the traditional Indian style have been known practically for their medicinal use. The preserves of various kinds are largely consumed by the lower-middle class and by way of prescriptions by a large number of people in India. The main production centres for preserves are Delhi, Amritsar and Banaras, although some manufacturing activity has been noticed in some other regions as well. Amongst the varieties of preserves manufactured, the important ones are apple, amla, petha, Myrabalan, carrot and ginger. The preserves are made from a number of other fruits but the quantities are small.

Table XXVII shows the samples of varieties of preserves and candied and crystallised fruits and peels which did not conform to specifications laid down in Parts VIII and IX of the Schedule to the Fruit Products Order, 1948. The abnormal defects have occurred in the case of apples, mangoes, petha, amla and crystallised and candied fruits. These are the main items of production and the improvement in quality of these products should be effected immediately.

TABLE XXVII.—*Percentage of different varieties of preserves and crystallised fruits which did not conform to Fruit Products Order specifications.*

Sl. No.	Products	Total samples	Samples not conforming	Percentage
Preserves—				
1.	Amla	37	6	16
2.	Apple	26	10	38
3.	Carrot	18	3	16
4.	Mango	22	5	22
5.	Petha	16	4	25
6.	Myrabalan	16	5	31
7.	Bael	10	2	20
8.	Others	35	2	6
	TOTAL	180	37	20·55
Crystallised fruits—				
	All varieties	15	6	40

The State-wise performance of preserves given in Table XXVIII shows that in Punjab as many as 38 per cent. of the samples did not conform to specifications while this figure was 20 in samples collected from Delhi. The production of preserves in other States is not important and the samples collected from other States have been put together in the figure "Other States".

TABLE XXVIII—*Performance of samples of preserves from different states as well as different categories of manufacturers.*

State	Categories of manufacturers	No. of samples	No. of samples not conforming	Total No. of samples per state	Total No. of samples per state not conforming	Percentage of samples not conforming
Delhi	LS	62	9	..	..	..
	SS	50	11	122	24	20
	CS	10	4	..	..	..
U.P.	LS	4	1	..	..	..
	SS	2	..	8	2	25
	CS	2	1	..	..	..
Punjab	LS	6	1	..	..	..
	SS	20	9	26	10	38
	CS	..	..	..	..	..
Others	LS	3	..	..	..	..
	SS	..	..	27	5	18
	CS	24	5	..	..	..
TOTAL	LS	75	11	..	..	..
	SS	72	20	174	41	23
	CS	27	10	..	..	..

Table XXIX shows the various defects found in samples which did not conform to specifications in case of preserves and candied and crystallised fruits and peels. Fermentation, swollen cans, unattractive appearance, less drained weight and low soluble solids were the major defects.

TABLE XXIX.—*Percentage of defects in samples of preserves and crystallised fruits and peels which did not conform to specifications.*

Sl. No.	Defects	Preserves (37 samples)	Percentage	Crystallised fruits (6 samples)	Percentage
1.	Fermentation	20	54	1	..
2.	Swollen cans	15	40	..	..
3.	Not attractive	12	32	..	..
4.	Less drained weight	9	27	..	..
5.	Low soluble solids	8	24	6	100
6.	Positive fermentation test	8	24	..	..
7.	Sugar crystallisation	1	3	..	..
8.	Not palatable	1	3	..	..
9.	Objectionable flavour	1	3	..	..
	TOTAL	37	..	6	..

1. *Fermentation.*—The detection of fermentation in a large number of samples is not surprising as in the process of manufacture most of the manufacturers allow their products to ferment before the product is brought to the required strength of soluble solids content. It is understood that this practice is rooted in the principle that the consumer demands a product which has got a flavour and taste associated with a slightly fermented fruit. This is particularly so in case of apples. Further, this practice may be related to the fact that the fermentation may hasten loosening of structure of the fruit and subsequent penetration of sugar in the inner portion of the fruit. If the practice of allowing the fermentation of the product during the process of manufacture has to continue, there is a greater need for vigilence in checking this fermentation at the finished product stage. This can only be checked by proper processing and checking of the soluble solids content of the finished product. This fermentation may, further be caused by external factors like improperly cleaned tins, improper storage, contamination from other sources during storage or handling of the material. It has also been observed that during the storage of preserves, in the case of a large number of manufacturers, the product loses its soluble solids content due to inherent fermentation which is unintentionally permitted in the finished product. This loss is made up at the time of sales. While executing the orders the manufacturer again examines the product and if it is found fermented or to be low in soluble solids, it is again put on the fire for further addition of sugar or for making up the strength of sugar. This practice helps in inactivating the inherent infestation. The manufacturers should examine this issue from the point of view of large amount of sugar which is being lost in feeding of yeast by way of fermentation with perhaps no gain in the bargain. It is suggested that when the product is brought to the finished stage it should be examined to see whether the penetration of sugar in the fruit or vegetable is complete and that the strength of sugar is uniform and is up to the required minimum standards prescribed under the Fruit Products Order. The minimum standards for soluble solids in this particular case ensures preservation of the product as at that level of concentration of sugar no fermentation is likely to occur. The product should then be properly packed in cleaned and properly washed containers and sealed so that no further contamination is likely to occur.

The storage of the product is also an important factor as in many cases one leaked tin in a pile spoils large number of tins by causing rusting, pin-holing and subsequent damage to a large number of other tins.

2. *Swollen cans.*—In most of the cases this defect may be related to the fermentation in the product. The samples of preserves which have been found in hemetically sealed cans have not been found to be properly processed. Table XXX shows variation in vacuum and pressure in samples which conformed to specifications. It will be observed that in 75 per cent. of the samples the product did not have adequate vacuum. While packing the product in sanitary top cans, it is necessary to properly exhaust the cans so that adequate vacuum is obtained in the finished product. In case of large-sized tins the defect of swollen cans is not apparent as the sealing of cans is not hermetic and so the gases evolved due to fermentation have a chance of escape.

TABLE XXX.—*Variation in vacuum and pressure in 132 samples of preserves which conformed to specifications.*

	Percentage
1. Showing positive pressure although looking normal	34·09
2. Zero Vacuum	43·18
3. Vacuum between 1" to 6"	18·18
4. Vacuum above 6"	4·55
TOTAL	100·00

3. *Not attractive.*—The preserved trade grades varieties of products according to the size. In case of apples, amla, harrar and other products the grading is done according to the size of the individual units. However, size should not be the only criterion for grading. Colour, texture, appearance and clarity of the covering liquid should be taken into consideration.

The peeling of the fruits is not supervised by most of the manufacturers. It is mostly done on contract basis with little or no attention to the final product. In large number of cases heavy losses may have been occurring during preparation. Further, the product is malhandled during pricking which is an essential step in the manufacture of preserves. There is need for improvement and standardization in the process of pricking and special care should be taken to see that no metallic contamination occurs during the process. The raw materials should be preferably handled on the tables with suitable safeguard that after pricking the fruit is not exposed to dust, flies and other insects and is properly washed and kept under water before processing. All these factors reflect on the finished product which in many cases has been found to be not well presented. A close supervision and checking of the products at every stage would ensure better quality products.

4. *Low drained weight.*—As many as 25 per cent. of the samples, from samples which did not conform to specifications, had low drained weight. This is a serious defect as the consumer is deprived of the full value of his money. At present the minimum specifications require 45 per cent. drained weight in the product, which is rather low as during the process the soluble solids content of the fruits and vegetables is increased to 68 per cent. sugar and consequently the weight of the fruit is increased. Considering this, it has been proposed to increase the drained weight in case of preserves from 45 per cent. to 55 per cent. in the revised specifications. Table XXXI shows the range of drained weight in samples which conformed to specifications. It will be observed that large number of samples had more than 50 per cent. drained weight.

TABLE XXXI.—*Variation in drained weight in 143 samples of preserves which conformed to specifications.*

Percentage of soluble solids	Variation
1. 45–50	7·69
2. 51–60	32·17
3. 61–70	34·27
4. 71–80	11·89
5. 81–100	13·98
TOTAL	100·00

5. *Soluble solids.*—This defect has been discussed while discussing the question of fermentation and it is likely that in large number of cases in spite of the product containing the minimum soluble solids content, may have lost some of the sugar due to fermentation. There is also likelihood of equalization of sugar if the penetration of sugar into the fruit is incomplete, thereby causing a drop in the soluble solids content of the product. Table XXXII shows variation in percentage of soluble solids in the samples of preserves which conformed to specifications.

TABLE XXXII.—*Variation in percentage of soluble solids in samples of preserves which conformed to specifications.*

Soluble solids range	Percentage
65-70%	58·74
70-78%	41·26
TOTAL	100·00

In the case of candied and crystallised fruits and peels the low soluble solids content has been due to two factors: firstly, due to less percentage of reducted sugar which should not be less than 40 per cent. and secondly due to less percentage of total sugar. The reduced sugar requirement in case of candied and crystallised fruits and peels can be fulfilled by proper inversion of sugar by adding acid during the process of manufacture.

As suggested in the case of jams, it is recommended that the manufacturers should equip themselves with refractometer to check the final strength of soluble solids and see that the product is brought to a uniform level of soluble solids. It is also important to see that no loss occurs in the strength during the stipulated period of storage, say 15 days, prior to the final sale.

Besides the above defects in certain samples, the laboratory has observed sugar crystallization, unpalatability and objectionable flavours and presence of insects. This is rather a serious matter and the manufacturers should see that the conditions in the factory are kept more sanitary and every effort is made to keep out all foreign matter and insect infestation. Some of these defects can be traced to the fact that the peeling and preparation of fruits and vegetables has not been carried out in the approved premises of the manufacturers but by contract labourers who may do the work in their houses or in fruit and vegetable markets. It has been argued that during the peak season of gluts such a practice is unavoidable. The manufacturers should realise that the consumer is becoming quality conscious every day and, therefore, effort should be made to have a complete check on preparation and processing of the products.

The conditions of manufacture of preserves have not been wholly satisfactory as most of the manufacturers have inherited this business from their forefathers and have inherited with it the premises, the methods and mode of handling these products. In recent years here has been some improvement in the premises as well as in handling of the fruits and vegetables.

Revised specifications

Some important changes have been made in the revised specifications for preserves. These are:

1. The minimum drained weight has been increased from 45 per cent. to 55 per cent.;

2. Use of preservatives has been permitted to the extent of 40 p.p.m. of SO_2 or 20 p.p.m. of Sodium Benzoate;

3. The product when packed in sanitary top cans, shall not have headspace less than 15 per cent. of the total volume of the can; and

4. The preserves shall only be packed in new tins and not in second-hand canisters or tins.

Tomato products

Tomato products have become increasingly popular during recent years. The main varieties of products which are manufactured from tomatoes are tomato juice, tomato puree and tomato ketchup or sauce.

The production of tomato ketchup has been taken up by a large number of manufacturers. Availability of tomato in almost every State holds out a good promise for developing these products.

Standard of quality.—Table XXXIII shows the samples of tomato juice, tomato puree and tomato ketchup which did not conform to specifications laid down in Parts XI, XII and XIII respectively of the Schedule attached to the Fruit Products Order, 1948. It will be observed that in the case of tomato ketchup the percentage of samples which did not conform to specifications is 65·8%. The defect on account of excess of added preservatives alone claimed as many as 81 per cent. of the samples.

TABLE XXXIII.—*Percentage of samples of tomato products which did not conform to Fruit Products Order specifications.*

Sl. No.	Product	Total No. of samples	Samples not conforming	Percentage
1.	Tomato juice	95	19	20·00
2.	Tomato puree	14	3	21·43
3.	Tomato ketchup or sauce	272	179	65·8

The State-wise performance in respect of tomato ketchup showed that in Delhi as many as 74 per cent. of the samples did not conform to specifications. This was followed by Bombay having 67 per cent., Madhya Pradesh having 64 per cent. and West Bengal 54 per cent.

TABLE XXXIV.—*Performance of samples of tomato ketchup from different states as well as different categories of manufacturers.*

State	Categories of manufacturers	No. of samples	No. of samples not conforming	Total No. of samples per state	Total No. of samples per state not conforming	Percentage of samples not conforming
Delhi . . .	LS	45	34	..	..	..
	SS	42	28	101	74	74
	CS	14	12	..	..	..
U.P. . . .	LS	4	1	..	..	..
	SS	8	2	20	7	35
	CS	8	4	..	..	..
Punjab . . .	LS	..	..	..	..	..
	SS	1	1	5	2	..
	CS	4	1	..	..	..
Bombay . . .	LS	11	8	..	..	..
	SS	14	9	40	27	67
	CS	15	10	..	..	..
Madras . . .	LS	..	..	..	..	..
	SS	5	4	6	4	..
	CS	1	..	..	..	..
Madhya Pradesh .	LS	24	13	..	..	..
	SS	1	1	25	14	64
	CS	..	..	..	..	..
Mysore . . .	LS	..	..	..	..	..
	SS	1	..	3	..	
	CS	2	..	..	..	..
Travancore-Cochin .	LS	..	..	..	..	..
	SS	..	..	..	..	..
	CS	..	..	..	..	..
West Bengal . .	LS	23	15	..	..	..
	SS	28	17	72	39	54
	CS	21	7	..	..	..
Others . . .	LS	..	..	..	..	..
	SS	1	..	1	..	..
	CS	..	..	..	..	..
TOTAL .	LS	107	71	..	..	..
	SS	101	62	273	167	61
	CS	65	34	..	..	..

Tables XXXV, XXXVI, and XXXVII indicate defects found in tomato juice, tomato puree and tomato ketchup respectively.

TABLE XXXV.—*Percentage of defects in samples of tomato juice which did not conform to specifications* (19 *samples*).

	Percentage
1. Excess of bacterial count (not in excess of 100 million per c.c.) .	9 47
2. Excess of mould count (not in excess of 20 per cent. of the field examined	8 42
3. Presence of preservatives	8 42
4. Swollen cans	6 31
5. Unattractive in appearance	4 21

TABLE XXXVI.—*Defects in samples of tomato puree which did not conform to specifications (3 samples).*

1. Swollen cans	2
2. Excess of bacterial count (not in excess of 100 million per c. c.)	1
3. Excess of preservative (minimum of 250 p.p.m. of Sodium Benzoate)	1
4. Unattractive	1
5. Unpalatable	1
6. Objectionable flavour	1

TABLE XXXVII.—*Percentage of defects in samples of tomato ketchup which did not conform to specifications (179 samples).*

		Percentage
1. Excess of added preservative (not in excess of 250 p.p.m.)	146	81
2. Not palatable	54	30
3. Excess of bacterial count (not in excess of 100 million per c.c.)	47	26
4. Not attractive	23	13
5. Excess of yeast and spore counts (not in excess of 125 per 1/60 c.m.m.).	16	9
6. Excess of mould count (not in excess of 40 per cent. of the field examined).	13	7
7. Less total solids	11	6
8. Objectionable taints and flavour	3	1·7
9. Presence of starch	1	0·5
10. Presence of extraneous matter	1	0·5

Excess of added preservative.—In case of tomato juice the specifications do not permit addition of any preservative while in case of tomato puree and tomato ketchup the sodium benzoate content has been permitted to the extent of 250 p.p.m. Tomato juice being a product pasteurized either after bottling or canning needs no preservative for preservation. In the case of tomato ketchup the prescribed dose of 250 p.p.m. has been found to be insufficient by many manufacturers under the present conditions of manufacture, storage and handling in India. They have, therefore, resorted to higher doses of preservatives; but this has been rather overdone by a large number of manufacturers who used doses higher than even 1,000 p.p.m. In the revised Fruit Products Order specifications the limit of preservatives in tomato ketchup has been increased to 750 p.p.m. It is further important to note that care should be taken to calculate the dose of preservative correctly and the weighment of the preservative should be more carefully done. It is also advisable not to depend entirely upon the action of preservatives for preserving the product. Adequate care should be taken to select the right type of raw material, proper washing, cleaning and inspection as well as proper cleaning of bottles, corks and other packing material. The primary infection should be reduced to the maximum extent possible in order to help the product

keep in good condition with the maximum dose of the permitted preservative. It is suggested that some form of processing should be introduced in the case of tomato ketchup. One simple way of processing is to fill the product as hot as practicable and place the bottles in hot water at about 200°F or above for a few minutes or keep the bottles overnight in the same water to cool off.

Unpalatability.—In some of the samples unpalatability may be connected with the excessive dose of the added preservative. Higher doses of sodium benzoate bring about a kind of bitter taste to the product and even a burning sensation. It is, therefore, doubly advantageous to use a lower dose of preservative. The use of various combinations and types of spices is left to the discretion of the manufacturers but it is possible that in many cases some of the spices in combination do not produce agreeable taste. There is also a chance of metallic contamination particularly from copper if the product is left in untinned utensils or is cooked in such utensils. It has also been reported by some manufacturers that some varieties of tomatoes in particular regions produce a bitter taste in the final product.

Excess of microbio-load.—This defect has a direct relation with the quality of the raw material. The bacterial count has claimed 47 per cent. of samples in tomato juice and 26 per cent. of samples in the case of tomato ketchup. The yeast, spores and mould count has been 2 per cent. in tomato juice and 16 per cent. in tomato ketchup in the samples which did not conform to specifications. The primary infection of tomatoes shall have to be checked at the raw material stage and unless the manufacturers use sound, wholesome fruits, the chances of reduction of mould, yeast and bacterial counts are remote. The revised specifications for tomato ketchup have not been altered with respect to the microbiological analysis to ensure greater check on quality of raw material.

Less total soluble solids.—In the case of tomato juice the minimum total soluble solids were maintained by all the samples examined. Table XXXVIII shows the range of total soluble solids in samples of tomato juice.

TABLE XXXVIII.—*Variation in total soluble solids in 76 samples of tomato juice which conformed to specifications.*

Total solids per cent.	Percentage of samples
1. 5–10	72·37
2. 11–16	27·63
TOTAL	100·00

While considering this aspect of total soluble solids in tomato juice, it will be interesting to see how the samples have behaved with respect to percentage of added salt for which a specified limit has been prescribed at 1·5% by weight. Table XXXIX shows the percentage of salt with respect to tomato juice samples.

TABLE XXXIX.—*Variations in percentage of salt in 76 samples of tomato juice which conformed to specifications.*

Per cent. Salt	Percentage
1. 0·1–0·5	10·53
2. 0·6–1·0	57·89
3. 1·1–1·5	31·58
TOTAL	100·00

In tomato puree the percentage of total soluble solids has not been prescribed. In the revised specifications the minimum soluble solids content with regard to tomato puree has been prescribed at 9 per cent. It will be, therefore, interesting to see how the samples of tomato puree have behaved with respect to total soluble solids. This is represented in Table XL.

TABLE XL.—*Variation in total soluble solids in 11 samples of tomato puree which conformed to specifications.*

Total soluble solids	Percentage
1. 7–10	45·45
2. 11–15	9·1
3. 16–20	45·45
TOTAL	100·00

In tomato ketchup 6 per cent. of samples did not conform to specifications. From amongst the samples which conformed to specifications the variation in total soluble solids content is shown in Table XLI.

TABLE XLI.—*Variation in total soluble solids in 93 samples of tomato ketchup which conformed to specifications.*

Total soluble solids	Percentage
1. 25–30	37·63
2. 31–40	41·94
3. 41–50	8·60
4. 51–60	9·68
5. 61–65	2·15
TOTAL	100·00

Other defects.—Some of the samples have been found unattractive and having objectionable taints and flavours, and presence of starch and extraneous matter. Use of proper colour is an important factor in the manufacture of tomato ketchup and tomato products. It is desirable to match the shade of colour with the standard samples kept for comparison. Many samples have been found to have turned black due to long storage. The manufacturers should try to see that there is no unusually long time lag between the manufacture and the final sale of the product.

The main handicap in the manufacture of tomato products has been the inconsistency of the quality and variety of the tomatoes available in the market. Most of the manufacturers depend on local markets for their purchases of tomatoes as is the case with almost all the fruits and vegetables consumed by the fruit and vegetable products manufacturers. The manufacturers have not been quality conscious and have not stipulated any quality standards for purchases of tomatoes. In certain cases tomatoes of very doubtful quality and even almost over-ripe, meshed up and broken have been purchased by the manufacturers. There have been cases where insect infestations have also been noticed. It is well to remember that no process or the technique can improve upon the inherent defects in the raw materials and for a better standard and quality product the maxim that the quality begins from the farm, is a paramount truth. A premium paid for a reasonably good quality tomatoes pays by way of quality of the product. The manufacturers should not take advantage of the consumer's inability to differentiate between different classes of products as the defects cannot be seen by naked eye.

Besides the use of poor quality raw materials, adequate attention has not been paid to proper washing of fruits. Proper attention is not being paid to coring of fruits as well as to separating the fruits damaged or infested by insects.

Complaints have also been received—and this has been verified by the laboratory—with regard to the use of various adulterants in the manufacture of tomato ketchup. These adulterants have been varying but few amongst them are dried raw mango slices, mango slices in brine, pulp of pumpkin, potatoes, carrots and other such materials. For the healthy growth of the industry it is imperative that the manufacturers do not indulge in unhealthy practices and produce goods only according to at least the required minimum standards. For the sake of convenience of marketing sauces other than tomato ketchup, in the revised specifications a separate provision has been made which would enable the manufacturers to market fruits and vegetables sauces manufactured from different varieties of fruits and vegetables.

Revised specifications

Following important changes have been made in the revised specifications for tomato ketchup :—

1. Specifications for tomato soup and tomato paste have been provided;

2. Separate specifications for sauces made from other fruits and vegetables have been provided;

3. In tomato juice, yeast, spores and bacterial counts have been dropped while the minimum specifications for mould count have been increased to 30 per cent. of the field examined instead of 20 per cent.;

4. Incubation test at 37°C for seven days has been introduced for tomato juice and tomato puree;

5. Soluble solids content has been prescribed at 9 per cent. for tomato puree;

6. Yeast, spores and bacterial counts have been dropped in the case of tomato puree while the mould count has been increased to 60 per cent. instead of 40 per cent. of the field examined;

7. In tomato ketchup the minimum percentage of acidity has been prescribed at 1·2 per cent. of acetic acid;

8. Sodium benzoate content has been increased in the case of tomato ketchup to 750 p.p.m.; and

9. Addition of pectin or sodium alganeate up to 0·1 per cent by weight of the tomato ketchup has been allowed.

Vinegar

A large number of manufacturers deal in vinegar but it is very disturbing to see that hardly a few persons are manufacturing genuinely brewed vinegar. The production of vinegar has been, on an average, about 500 tons per year, out of which nearly 90 per cent. would be synthetic vinegar. Demand for good quality vinegar has been rather dwindling because of absence of good quality vinegar and severe competition from synthetic vinegar. Improper labelling has led the consumers in believing that vinegar manufactured by dilution of acetic acid is as good as one made by natural process of fermentation and acitification.

Table XLII shows the samples of varieties of vinegar which did not conform to specifications laid down in Part XIV of the Schedule attached to the Fruit Products Order, 1948. It will be observed that as many as 20 per cent. of samples of vinegar have not been found to conform to specifications. This shows a very negligent state of affairs as even in products like synthetic vinegar where no technical know-how is required, the percentage of samples which did not conform to specifications is so high.

TABLE XLII.—*Percentage of different varieties of vinegar which did not conform to Fruit Products Order, 1948 specifications.*

Product	Total No. of samples	Samples which did not conform	Percentage
Genuine vinegar—			
1. Jaggery	29	3	10
2. Malt vinegar	26	4	15
3. Sugarcane juice	15	2	13
4. Grape	11	2	18
5. Others	10	1	10
Synthetic vinegar	187	38	20
TOTAL	278	50	17·86

The samples collected from various states showed that Delhi had the largest number of samples which did not conform to specifications followed by Madras, West Bengal and U.P. The performance of Bombay State showed better results than others. Table XLIII shows the performance of samples of vinegar collected from various states.

TABLE XLIII.—*Performance of samples of vinegar from different states as well as different categories of manufacturers.*

State	Categories of manufacturers	No. of samples	No. of samples not conforming	Total No. of samples per state	Total No. of samples per state not conforming	Percentage of samples not conforming
Delhi	LS	4	1	..	..	..
	SS	10	3	22	5	22
	CS	8	1	..	..	..
U.P.	LS	..	..	..	..	..
	SS	..	..	20	3	15
	CS	20	3	..	..	..
Punjab	LS	..	..	..	..	..
	SS	2	..	9	4	..
	CS	7	4	..	..	..
Bombay	LS	20	1	..	..	..
	SS	28	3	83	8	9
	CS	35	4	..	..	..
Madras	LS	..	..	..	..	..
	SS	3	..	48	9	18
	CS	45	9	..	..	..
West Bengal	LS	30	3	..	..	..
	SS	37	6	111	18	16
	CS	44	9	..	..	..
Others	LS	..	..	..	..	..
	SS	4	..	10	3	30
	CS	8	3	..	..	..
TOTAL	LS	54	5	..	..	..
	SS	84	12	305	50	18
	CS	167	33	..	..	..

Table XLIV shows the nature of defects found in the samples of vinegar which did not conform to specifications.

TABLE XLIV.—*Percentage of defects in samples of vinegar which did not conform to specifications* (50 *samples*).

		Percentage
1. Less acidity	49	98
2. Sediment at the bottom	5	10
3. Not attractive	3	6
4. Synthetic vinegar branded as genuine vinegar	7	14

Less acidity.—Almost all the samples which did not conform to specifications failed on account of low acidity than the prescribed minimum of 4 per cent. Most of the manufacturers do not have any means of checking the final acidity of the product and as a result this defect is most likely to occur in the case of brewed vinegar. It is necessary that the manufacturers of brewed vinegar should have a small set for testing acidity so that the progress of acetification can be easily checked as well as the final acidity is properly known prior to bottling. The percentage of samples which fell into different acidity ranges is given in Table XLV.

TABLE XLV.—*Variations in acidity range in 230 samples of vinegar which conformed to specifications.*

Acidity (Grams per 100 c.c.)	Percentage
4–5	44·35
5–6	28·70
6–7	10·44
7–8	6·08
8–9	4·35
9 and above	6·08
TOTAL	100·00

The manufacturers should try to keep acidity of the product above 5 per cent. so that the quality of the product is improved. In brewed vinegar the percentage of final acidity will depend upon the percentage of sugar used, which should not be less than 10 per cent. if the final acidity of 5 per cent. is to be attained. 100 parts of sugar yield 51 parts of alcohol by fermentation theoretically but in actual practice only 45 to 47 per cent. is obtained because some of the sugar is used up by the yeast and other organisms for purposes other than alcohol production. In the conversion of alcohol into acetic acid the yield from 100 parts of alcohol would be theoretically 130 parts of acetic acid but in actual practice the yield is about 120 parts because certain other yeast and bacteria, which are quite sure to be present, also use alcohol as food, that is to say, every hundred parts of sugar being fermented under favourable conditions would yield 50 to 55 parts of acetic acid. It is not economical to use a very low concentration of sugar, *i.e.*, 10 per cent. as that would mean handling of large volume. It is, therefore, advantageous to use 14 per cent. to 18 per cent. sugar to begin with so that even if higher concentration of acetic acid is obtained in the final product, it can be diluted at that stage.

In brewing, adequate care has to be taken to see that the first stage of fermentation is progressing as rapidly as possible and is completed without any contamination by other organisms besides yeast. The yeast starter should be of pure origin and should be adequate in quantity from the start so that the influence of other organisms is minimised. In addition to sugar which is necessary for the growth of yeast, certain mineral salts and nitrogenous substances should also be supplied to the yeast for its proper growth. The absence of any one of these may cause a cessation of fermentation and may slow down the process of fermentation. Temperature is an important factor in the first stage of fermentation for alcoholic fermentation. Ordinary room temperature prevailing in India, *i.e.* from 75 to 85°F, is quite suitable, but if the temperature goes beyond 95°F, there is likelihood of serious losses accruing due to evaporation of alcohol. Alcoholic fermentation does not require any aeration for its completion.

The conversion of alcohol to acetic acid is a distinctly separate stage in the manufacture of brewed vinegar. The adjustment of alcoholic content in the liquid prior to starting acetification should be properly checked and the alcoholic content should not be so high

as would prevent vinegar bacteria from functioning properly. Alcohol in a concentration of 10 to 13 per cent. is readily fermented but any concentration beyond 14 per cent. or more may not be conducive to vinegar bacteria. The alcohol content should be adjusted to 10 per cent. Vinegar bacteria like yeast also should have special food and it requires certain inorganic salts such as Potassium Tartrate, Ammonium Phosphate and Ammonium Chloride, which should be supplied. The acetification process requires good amount of aeration as against the first alcoholic fermentation.

After the acetification is complete, which can be done by a slow process or by generator process, the ageing of the vinegar is important to develop flavour and clarity. Filtration and pasteurization of vinegar are two important factors in determining the final appearance and storage of the product. This must be attended to with great care as many a time the product may be inherently good but due to improper finish may look to be of inferior quality.

Sediment.—A large number of samples which conformed to specifications also showed sediment at the bottom and in many cases cloudiness. With the help of filtering aid brewed vinegar can be properly filtered after decantation. In the case of synthetic vinegar. use of good quality water, acetic acid, sugar and caramelised colour would yield a good product. Proper filteration should be done to see that the product is devoid of any extraneous matter. The washing of bottles and other packing material is also essential to obtain good results.

Manufacturers have been misbranding and misrepresenting the products in most of the cases. The products have been described as "malt vinegar", "grape vinegar" or "jaman vinegar" although the products had no relation with these mediums. There has also been a widespread practice of fortification of brewed vinegar with acetic acid. The revised specifications have provided that no fortification of brewed vinegar shall be done. However, the minimum percentage of acidity has been lowered from 4 per cent. to 3·75 per cent. in brewed vinegar.

The manufacture of synthetic vinegar is a simple affair of diluting acetic acid with water to make a solution of 4 per cent. acetic acid. To this a quantity of sugar and caramelised colour is added. But even in such a simple matter manufacturers have not been careful in adding the correct quantity of acetic acid so that the prescribed limit of 4 per cent. is attained. This actually amounts to selling coloured water as vinegar.

Revised specifications.

The revised specifications have made certain important changes. These are :

1. The percentage of acidity in brewed vinegar has been brought down to 3·75 per cent.;

2. Addition of acetic acid to brewed vinegar has been prohibited;

3. The ash content in brewed vinegar has been prescribed at 0·48 per cent.; and

4. The synthetic vinegar shall be labelled as "synthetic vinegar" and shall also have on the label the words "prepared from acetic acid".

Pickles

Pickles of various varieties with different tastes and combinations are being produced in Indian homes since times immemorial. Practically every home in the country prepares pickles. Varieties of pickles are, therefore, many. Hence the combinations not only of spices but also of other ingredients are immensely varied. Pickles can be broadly classified on regional basis and can be described as Maharastrian, Malabari, Panjabee, Bengali, Gujarati, etc.

The indigenous manufacturer, who is generally a small dealer in pickles, has no doubt, created a taste for his products. The pickle manufacturers would do well to imitate the fineness of character in varieties of pickles made at home. The reported figure of production does not give a correct indication of the total quantity of pickle production in India. Large scale activity in rural as well as in urban areas is noticed as far as pickle production is concerned.

Table XLVI shows the samples of varieties of pickles which did not conform to specifications laid down in Parts XV, XVI and XVII of the Schedule attached to the Fruit Products Order, 1948.

TABLE XLVI.—*Percentage of samples of vinegar pickles, lime juice pickles and oil pickles which did not conform to Fruit Products Order specifications.*

Product	Total No. of samples	Samples not conforming	Percentage
Vinegar pickles—			
1. Onions	37	3	8·1
2. Mixed pickles	24	5	20·0
3. Cherkin	15	2	13·0
4. Others	25	2	8·0
Lime-juice pickles	17	9	52·94
Oil Pickles—			
1. Mango	131	5	3·8
2. Lime	47	8	17·0
3. Mixed pickles	33	2	6·0
4. Brinjal	19	..	..
5. Others	62	6	9·0
TOTAL	310	42	13·5

Table XLVII shows performance of samples of pickles by various States. The samples collected from Delhi showed as many as 23 per cent. of samples not conforming to specifications. This was followed by Bombay and West Bengal having 13 and 10 per cent. of samples respectively. Samples collected from other States have shown fairly satisfactory results.

TABLE XLVII.—*Performance of samples of pickles from different states as well as different categories of manufacturers.*

State	Categories of manufacturers	No. of samples	No. of samples not conforming	Total No. of samples per state	Total No. of samples per state not conforming	Percentage of samples not conforming
Delhi	LS	44	11	..	..	..
	SS	28	8	82	19	23
	CS	10	..	..	..	..
U.P.	LS	..	..	..	..	..
	SS	7	..	16	1	6
	CS	9	1	..	..	..
Punjab	LS	3	..	..	..	..
	SS	11	..	24	2	8
	CS	10	2	..	..	..
Bombay	LS	12	3	..	..	..
	SS	14	2	61	8	13
	CS	35	3	..	..	..
Madras	LS	..	..	..	..	..
	SS	24	2	63	5	8
	CS	39	3	..	..	..
Mysore	LS	..	..	..	..	..
	SS	18	1	25	2	8
	CS	7	1	..	..	..
West Bengal	LS	95	2	..	..	..
	SS	49	12	188	19	10
	CS	44	5	..	..	..
Others	LS	..	..	..	..	..
	SS	3	1	8	5	..
	CS	5	4	..	..	..
TOTAL	LS	154	16	..	..	..
	SS	154	26	367	61	16
	CS	159	19	..	..	..

Defects.—Table XLVIII shows the various defects found in different types of pickles.

TABLE XLVIII.—*Defects in samples of vinegar pickles, lime pickles and oil pickles which did not conform to specifications.*

Defects	Vinegar pickles (12 samples)	Lime pickles (9 samples)	Oil pickles (21 samples)
1. Less drained weight	6	Not specified	..
2. Less acidity	4 (Not less than 2 per cent.)	1 (Not less than 3 per cent.)	..
3. Not palatable	2	Nil.	3
4. Not attractive	2	Nil.	4
5. Mould growth on surface	1	Nil.	3
6. Presence of extraneous matter or harmful colour.	1	Nil.	2
7. Contained preservative	Nil.	4	18
8. Low salt content	Not prescribed	8	Not prescribed (Not less than 15 per cent.).

Less drained weight.—Nearly 50 per cent. of the samples which did not conform to specifications in case of vinegar pickles have failed to comply with the requirements of drained weight, which has been prescribed at 66 per cent. The other samples which conformed to specifications have behaved in the marginal way as will be seen from Table XLIX where the range of drained weight has been analysed. Drained weight has not been prescribed in the case of other types of pickles because it would not be possible to separate the solid portion.

TABLE XLIX.—*Variation in drained weight in samples of vinegar which conformed to specifications* (89 *samples*).

Percentage of drained weight	Percentage
1. 66–70	67·42
2. 71–75	11·24
3. 76–80	4·49
4. 81–85	2·24

(Drained weight not calculated 14·61 per cent.)

Less acidity.—The acidity has been prescribed in the case of vinegar and lime pickles at 2 per cent. as acetic acid and at 3 per cent. as citric acid. Lack of checking and control can only explain the lower acidity in the case of vinegar pickles as most of the acidity is derived from added acetic acid. The manufacturers should be careful in making the solutions of acetic acid for use in the manufacture of pickles and should take into account dilutions which will occur after the solutions have been added to the fruits and vegetables and stored for some time. In the case of lime pickles the minimum requirement can be easily met because the natural acidity present in lime is 6 per cent. or above. This can bring acidity of the final product above the stipulated limit of 3 per cent. Table L shows the variation in acidity in samples of vinegar pickles and lime pickles which conformed to the specifications.

TABLE L.—*Variation in acidity in samples of vinegar pickles and lime pickles which conformed to specifications.*

Percentage acidity range	Vinegar pickles (89 samples)	Lime pickles (8 samples)
1. 2–3·99	66·29%	12·5%
2. 4–5·99	15·73%	37·5%
3. 6–7·99	15·73%	37·5%
4. 8–9·00	2·25%	12·5%

Presence of preservatives.—Some manufacturers have inadvertently used preservatives in pickles. Pickles do not require any preservative as the higher concentration of salt, acidity and oil would naturally act as adequate preservative for any spoilage or deterioration of the product.

Low salt content.—Nearly 57 per cent. of the samples in lime pickles have failed on account of lower salt content. It has been argued that the salt, which has been prescribed at 15 per cent., is too

high for consumers' preference. This fact has been taken into consideration and in the revised specifications the percentage of salt has been brought down from 15 to 12. Table LI shows the variation in percentage of salt in samples of lime pickles which conformed to specifications.

TABLE LI.—*Variation in percentage of salt in 8 samples of lime pickles which conformed to specifications.*

Percentage of salt	Percentage
15	37·5
16	25
21	25
22	12·5

Mould growth.—Mould growth has been noticed in a few of the samples examined. This can be avoided by attending to proper packing of the pickles and further by seeing that no solid portion of pickles is exposed as that would generally bring immediate attack of the mould.

Besides the samples of pickles which have specifications in the Fruit Products Order, some samples of brined pickles have also been examined. It was noticed that most of these samples behaved differently with respect to percentage of salt as would be seen from Table LII. These samples were mainly of mango slices in brine which are generally used by the chutney manufacturers for further processing. It is in the interest of chutney manufacturers to control the salt in the semi-processed product so that there may be uniformity in the finished product and the processing of chutney may be standardized.

TABLE LII.—*Variation in percentage of salt in samples of brined pickles* (21 *samples*).

Percentage of salt	Percentage
1. 7–9	23·80
2. 10–12	19·05
3. 13–15	33·34
4. 16–18	19·05
5. 19–21	4·76
TOTAL	100·00

Most of the manufacturers dealing in pickles have no standardized process of manufacture. The variation in the quality from one lot to the other is many times more striking. Some pickle manufacturers do work on large-scale, particularly those who handle mango pickles but the manufacture is unorganised. The mango slices which are generally peeled and sliced in the fields or in the markets are bought in a semi-processed stage. Varying quantities of salt are added and after storing overnight, these slices are filled in cans. The liquid which oozes out due to osmosis is added to the cans. A small quantity of

spices is added to each can. Generally the combination of spices is turmeric, chilli and phenugreak. A dash of oil is added to the top of the can as covering. This oil serves as a protection from external infection. This type of pickle is generally sold by the vendors, hotels, restaurants and railways.

The main drawback in preparation and processing of such type of pickles is the unhygienic method of handling. The mangoes are not cleaned or washed in water prior to addition of salt. The raw material contains extraneous matter as well as insect infestation. There is no separation of damaged or bruised or deceased fruits. The product is sold at competitive and cheap rates and hence the manufacturers are careless.

A large number of varieties of pickles which are sold as specialities like stuffed chillies, bamboo, gherkin, onions and pickles in vinegar are of good quality and during the manufacture of these products a good care and attention is paid.

Revised specifications

There has not been much change with respect to the specifications for pickles in vinegar except that the name of the product has been changed from "vinegar pickles" to "pickles in vinegar". In the case of pickles in citric juice other types of pickles in brine have been added. The minimum percentage of salt has been lowered from 15 to 12. In the case of oil pickles no major change has been made.

Schedules

Specifications for fruit juice, pulp, squashes, crush, cordials, fruit syrups and ready-to-serve fruit beverages

Products	Variety	Special Characteristics		General Characteristics
		Minimum percentage of total soluble solids in the final product	Minimum percentage of fruit juice in the final product	
Fruit Syrup	Any suitable kind and variety.	65	10	The only substances that may be added are water, peel oil, fruit essences and flavours, common salt, pectin, harmless food colours, sugar, invert sugar and/or liquid glucose, ascorbic acid, sulphur dioxide (not in excess of 350 parts per million by weight of the finished product) or sodium benzoate (not in excess of 1000 p.p.m.) or combination of these two preservatives in such a proportion that the combination does not exceed the limits set forth above for sulphur dioxide and citric acid, provided that the acidity of the finished product shall not be less than 4 per cent. in the case of pure lemon juice or pulp and not less than 5 per cent. in the case of pure lime juices, but shall not exceed 3·5 per cent. in the case of other juices, squashes, cordials and syrups expressed as anhydrous citric acid. Fruit juice or pulp prepared for further processing may contain 1000 parts per million of sulphur dioxide. Ready-to-serve beverages may contain sulphur dioxide or sodium benzoate up to the limit of 70 p.p.m. or 200 p.p.m. respectively. Canned or bottled pulp or juice
Crushes	Do.	55	25	
Squashes	Do.	40	25	
Cordials	Do.	30	25	
Unsweetened juice	Do.	Natural	90	
Sweetened juice	Do.	10	85	
Ready-to-serve fruit beverages	Do.	10	5	

shall not show any positive pressure at sea level and will show no sign of bacterial growth when incubated at 37° C for one week. Canned or bottled pulp or juice will not contain any preservative. The finished product shall have a good flavour and be free from objectionable taints and flavours. It shall be of good keeping quality and should show no sign of fermentation.

Fruit juice shall be unconcentrated liquid product expressed from ripe fruit and may contain portions of the pulp and other cellular matter natural to the fruit. Cordials shall be the clear final product prepared by adding sugar to the clarified juice, *i.e.*, from which pulp and other cellular matter have been removed. When frozen, the product may be described as "Ice Squash" or "Ice Cordial" in conjunction with name of the fruit, *e.g.*, ice orange squash, etc. In case of mango juice 45 per cent. water may be added if declared on the label. Fruit juice concentrates may contain 1,500 parts per million of sulphur dioxide.

Product	Variety	Special Characteristics			General Characteristics
		Minimum percentage of fruit juice in final product	Minimum percentage of total soluble solids in the final product	Minimum percentage of barley starch in the final product	
Barely waters	Any sutitable variety	25	30	0·25	Barley of good quality free from insect attack or fungal diseases shall be used. Fruit juice shall be derived from sound fresh fruit free from insect or fungal attack or any other blemish affecting the quality of the fruit. It shall be free from the pieces of skin, bits of coarse tissue and any extraneous matter. The only substances that may be added are water, sugar, invert sugar or liquid glucose, peel oil, flavour ascorbic acid, common salt, harmless food colours, flavouring matter, sulphur dioxide (not in excess of 350 p.p.m.) or sodium benzoate not in excess of 1000 p.p.m. or a combination of these two preservatives in such a proportion that the combination does not exceed the limit set forth above for sulphur dioxide and citric acid in sufficient quantity to bring the acidity of the finished product up to a maximum of 2·5 per cent. as anhydrous citric acid. The finished product shall have a good flavour characteristic of fruit used and be free from burnt or any other objectionable taints or flavours. It shall be of good keeping quality and shall show no sign of fermentation.

Specifications for synthetic syrups and sharbats

Product	Variety	Special Characteristics	General Characteristics
Synthetic syrups and Sharbats.	Any kind prepared from harmless herb flowers or essences.	Minimum percentage of total soluble solids in the final products. 65	The only substances that may be added are water, citric acid, harmless herbs, drugs, flowers, essences, sugar, invert sugar or liquid glucose and harmless food colours, sulphur dioxide (not in excess of 350 p.p.m.) or sodium benzoate (not in excess of 1000 p.p.m.) or a combination of these two preservativ esin such a proportion that the combination does not exceed the limits set forth for sulphur dioxide, as preservative. The finished product shall have a good and pleasant taste and flavour, truly characteristic of the flavouring material used and be free from burnt or any other objectionable taints and flavour and crystallization of sugar. It shall be of good keeping quality and should show no sign of fermentation. No artificial sweetening agent shall be used.

The container of synthetic syrups will not bear any label which will lead the consumer into believing that it is genuine fruit product. In addition the label will have the word "Synthetic" distinctly and clearly displayed on it. Synthetic syrups will be clearly marked as "contains no fruit juice" Rose, Khus Kewra. Sandal and other such syrups may not be delcared as synthetic but shall not bear pictures of fruits on the labels.

Specifications for bottled and canned fruits and vegetables

Product	Variety	Special Characteristics	General Characteristics
Bottled or canned fruits	Any fruit of suitable variety.	The head space in the can shall not be more than 5/8th of an inch. The drained weight of fruit shall not be less than 50 per cent. of the net weight of the contents (except in the case of berry fruit where this limit will be 40 per cent.). Drained weight shall be determined by draining the contents for two minutes on a sieve of diameter 8″×8″ having 8 meshes per linear inch.	The fresh fruit to be canned shall be approaching maturity and it shall be practically free from blemishes and shall not have stalks, leaves and other extraneous matter. Where fruit is required to be cut it shall be cut in halves, quarters or cubes or pieces, reasonably uniform in size. The only substances that may be added are fruits, sugar, invert sugar, citric acid and water. After processing the fruit shall be firm and the covering liquid clear. The product shall not show any positive pressure at sea level and shall not show any sign of bacterial growth when incubated at 37°C for one week. No preservative shall be added. No artificial colouring matter shall be present, except in the case of cherries and straw-berries where harmless food colour may be added.
Bottled or canned vegetables.	Any vegetable of suitable variety.	The head space in the can shall not be more than 5/8 th of an inch. The drained weight of the vegetables shall not be less than 55 per cent. of the net weight of the contents. (Except in the case of canned tomatoes where this limit will be 50 per cent.). Drained weight shall be determined by draining the contents for two minutes on a sieve of diameter 8″×8″ having 8 meshes per linear inch.	The vegetable shali be reasonably fresh tender, of good colour and flavour and shall be free from pods, stalks, detached skin, extraneous matter like woody fibre, roots, etc., and shall be practically free from blemishes. The only substances that may be added are vegetables, sugar, salt, water, oil or fat, spices, sauce, citric acid and soluble calcium salt. The product shall not show any positive pressure at sea level and shall not show any sign of bacterial growth when incubated at 37°C and 55°C for one week. No preservative shall be used. No artificial colouring matter shall be present except in case of peas where harmless food colour may be added.

Peas or any other product which have been dried or otherwise processed before canning must be described as processed and may not be described as 'Green Fresh' or garden produce. It shall be clearly marked as prepared from dried raw material. Dehydrated and dry fruits if canned shall be clearly marked as prepared from dried raw material,

Product	Kind and variety of fruit	Minimum percentage of fruit in the final product on fresh fruit basis	Minimum percentage of soluble solids in the final product	Special Characteristics.	General Characteristics
Jams and Fruit cheese.	Any fruit. Any suitable variety.	45 In case of Raspberry and strawberry jams 25.	68	The finished product shall have a firmgel consistency.	It may be a single or mixed fruit jam. The fruit used shall be mature, fresh, sound, clean and free from fermentation and mould. Dry or canned fruit, preserved pulp or juice may be used. Pectin derived from any fruit may be added when necessary. The only substances that may be added are sugar, invert sugar or liquid glucose, ascorbic acid, citric, tartaric, malic acid, harmless colour, flavouring food matter and sulphur dioxide not in excess of 40 p.p.m. or sodium benzoate not in excess of 200 p.p.m. as preservative. It shall have the flavour of the original fruit and shall be free from burnt or other objectionable flavours, crystallization mould growth and shall show no sign of fermentation. If packed in cans, it shall not show any positive pressure at sea level. No artificial sweetening matter shall be added.

When dry fruit is used it shall be clearly declared on the label.

Product	Kind and variety of fruit	Minimum percentage of fruit in the final product on the fresh fruit basis	Minimum percentage of soluble solids in the final product	Special Characteristics	General Characteristics
Fruit jelly and marmalade.	Any fruit. Any suitable variety.	45	65	Fruit jellies shall be made from clear strained fruits extract prepared by boiling the fruit with water. Marmalades shall be made either from strained extract from citrus fruits prepared by boiling the fruit with water or shall be made from fruit juice or pulp. Marmalade shall have suspended slices of peel.	The fruit used shall be sound, clean and free from fermentation and mould. The finished product shall be reasonably uniform and shall be of good keeping quality and attractive colour. Only substances that may be added are sugar, invert sugar or liquid glucose, ascorbic acid, citric, tartaric, malic acid, harmless food colour, flavouring matter and sulphur dioxide not in excess of 40 p. p. m. or sodium benzoate not in excess of 200 p. p. m. as preservative. Fruit jelly shall be a product of gelatinous consistency prepared by boiling strained fruit extract with sugar. It shall be clear sparkling transparent and of an attractive colour. It should not be syrupy, sticky or gummy and should retain the flavour and aroma of the original fruit. No artificial sweetening matter shall be added.

The jelly made from sugar and chemical pectin shall be clearly declared as synthetic jelly.

Specifications for candied and crystallised or 'glaced' fruit and peel

Product	Kind and variety	Special Characteristics		General Characteristics
		Percentage of total sugar	Percentage of reducing sugar to total sugar	
Candied and crystallised or glaced fruit and peel.	Any fruit of suitabale variety.	Not less than 70 .	Not less than 40 .	Candied fruit or peel shall be derived from firm ripe or a slightly mature fruit practically free from insect or fungal attack or any other blemish affecting the quality of the fruit. The only substances that may be added are sugar, invert sugar or liquid glucose, citric acid, soluble calcium salts, harmless food colour, flavouring matter, and sulphur dioxide not in excess of 150 p.p.m. as preservative. 'Glaced' fruit or peel shall be derived from candied product coating with a thin transparent layer of heavy syrup with or without pectin which has dried to a more or less firm texture on the fruit. Crystallised fruit or peel shall be derived from candied product by coating with pure white crystallised sugar or by drying the syrup on wet candied fruit. The finished product shall be translucent and not hard or granular. It shall have a good flavour and shall be free from burnt or any other objectionable flavour.

Product	Kind and variety of fruit	Minimum percentage of fruit portion in final product	Minimum percentage total soluble solids in the product	General Characteristics
Preserves . . .	Any fruit of suitable variety.	55	68	It may be a single or mixed preserve but fruit or vegetable used shall be mature, fresh, sound and clean. The only substances that may be added are sugar, invert sugar or liquid glucose, jaggery, citric, tartaric or malic acid, ascorbic acid, harmless food colours, flavouring matter, and sulphur dioxide to the extent of 40 p.p.m. or sodium benzoate to the extent of 200 p.p.m. as preservative. The fruit shall retain form and shall be permeated with the syrup without shrivelling of the individual pieces. It shall be of good keeping quality and attractive colour and it shall be free from burnt and other objectionable flavour, crystallization and mould growth. The product shall not show any fermentation when examined. When packed in cans, it shall show no positive pressure at sea level.

When packed in sanitary top cans, the content shall not be less than 85% of the total space of the can.

Product	Variety	Special Characteristics			General Characteristics
		Minimum percentage of fruit in the final product	Minimum percentage of total soluble solids in the product.	Mould count	
Fruit Chutney	Any fruit of suitable variety.	40	50	Not in excess of 40% of the field examined.	The product shall be derived from fruit, free from insect or fungal attack. All ingredients used in the preparation of chutney shall be thoroughly clean. The only substances that may be added are fruit or fruit pulp, raisins, dry fruit, spices, salt, sugar, jaggery, vinegar, acetic acid, onion, garlic, harmless food colour and sulphur dioxide not in excess of 250 p.p.m. as preservative. It shall be of good keeping quality and shall show no sign of fermentation when incubated at 28—30°C and 37°C.

When it is declared as fruit chutney, the names of fruits may not be declared on the label.

Any fruit when calculated in combination with raisins and dry fruits if used in excess of 5% of 40% fruit content in mango chutney or other chutney. shall be declared on the label.

Specifications for tomato juice and soup

Product	Variety	Minimum percentage of total soluble solids W/W	Special Characteristics Mould count	General Characteristics
Tomato juice and soup	Any suitable variety of tomato.	Tomato Juice 5 Tomato Soup 7	Not in excess of 30% of the field examined.	Tomato juice shall be liquid product derived from sound fresh and fully ripe tomatoes practically free from insect and fungal attack or any other blemish affecting the quality of the fruit and may contain finely divided insoluble solids from the flesh of tomatoes. It shall be free from pieces of skin, seeds, bits of coarse tissue and any extraneous matter. The only substances that may be added are salt not in excess of 1·5% by weight, water to the extent of making up any loss during heating, sugar, citric, malic, tartaric or lectic acid, ascorbic acid and harmless food colours. In tomato soup the only substances that may be added are spices, sugar, salt, starch, butter and milk solids. The finished product shall have a good flavour characteristic of tomato and be free from burnt or any other objectionable flavour. It shall be of good keeping quality and shall show no sign of fermentation when incubated at 37°C for 7 days. When canned it shall not show any positive pressure at sea level.

Product	Variety	Special Characteristics			General Characteristics
		Mould count	Minimum percentage of soluble solids free of salt		
Tomato Puree and and Paste.	Any suitable variety of tomato.	Not in excess of 60% of the field examined.	Tomato Puree Tomato Paste	9 25	The product shall be derived from sound fresh and fully ripe tomatoes practically free from insect or fungal attack or any other blemish affecting the quality of the fruit. Properly prepared and strained tomatoes shall be free from skins and seeds. The only substances that may be added are common salt, citric acid, malic acid, or tartaric acid, spices, harmless food colours, and sodium benzoate and not in excess of 250 p.p.m. as perservative. The finished product shall have a good flavour characteristic of the tomato and be free from burnt or any other objectionable flavour. It shall be of good keeping quality and shall show no sign of fermentation when incubated at 37°C for 7 days. When canned it shall not show any positive pressure at sea level.

Percentage of total solids must be declared on the label.

Specifications for Tomato Ketchup

Product	Variety	Total acidity as acetic acid	Minimum total soluble solids	Special Characteristics			General Characteristics
				Mould count	Yeast and spores	Bacteria	
Tomato Ketchup	Any suitable variety of tomato.	1·2%	25%	Not in excess of 40% of the fields examined.	Not in excess of 125 per 1/60 c.m.m.	Not in excess of 100 million per c.c.	The product shall be derived only from sound and wholesome tomatoes practically free from insect or fungal or any other blemish affecting the quality of the fruit. Skins and seeds shall be excluded. The only substances that may be added are spices, salt, sugar, vinegar, citric acid, acetic acid, lectic acid, onion, garlic, harmless food colour, sodium benzoate not in excess of 750 p.p.m. as preservative and pectin or sodium algenate not in excess of 0·1% by weight. The finished product shall have good flavour and shall be free from burnt or any other objectionable flavours. It shall be of good keeping quality and shall show no sign of fermentation.

Product	Kind and variety	Special Characteristics				General Characteristics
		Mould count	Yeast and Spores	Bacteria	Minimum percentage of acidity as acetic acid	
Sauce .	Any suitable kind and variety of fruit or vegetables.	Not in excess of 40% of the field examined.	Not in excess of 125 per 1/60 c.m.m.	Not in excess of 100 million per c.c.	1·2	The product shall be derived from wholesome fruits and vegetables which shall be practically free from insect or fungal attack or blemishes affecting the quality of the fruit. The only substances that may be added are fruit, vegetable, pulp, juice, dried fruits, sugar, spices, salt, vinegar, acetic acid, citric acid, malic acid, tartaric acid, onions, garlic, harmless food colours, flavouring material and sodium benzoate not in excess of 750 p.p.m. as preservative. The finished product shall have good flavour and shall be free from burnt or other objectionable flavours. It shall be of good keeping quality and shall show no sign of fermentation when incubated at 37°C.

The names of the fruit, vegetables or dried fruit used shall be described on the tlabel.

Product	Variety	Special Characteristics Minimum percentage of acidity in final product	General Characteristics
Brewed and Synthetic Vinegar.	Any suitable medium such as fruits, malts, molasses, sugarcane juice, etc.	Brewed Vinegar—3·75 Synthetic Vinegar —4	Brewed vinegar is a product of alcoholic fermentation and subsequent acetification of one or more of the suitable medium. Brewed vinegar shall not be fortified with acetic acid. It shall not contain any mineral acid or poisonous metal, foreign substance or other injurious ingredients. The ash content of brewed vinegar shall not be more than 0·48%. Only caramal colour shall be used. Vingear shall be pleasant in taste and flavour.

The kind of medium used for preparing brewed vinegar shall be declared on the label. Synthetic vinegar shall be distinctly labelled as " Synthetic Vinegar" and shall state on label "prepared from acetic acid".

Specifications for pickles in Vinegar

Product	Variety	Special Characteristics: Minimum percentage of acidity of fluid portion as acetic acid	General Characteristics
Pickles in vinegar.	Any vegetable of suitable variety.	2	The vegetables used in the preparation of pickles shall be wholesome. They shall be practically free from fungal or insect attack. All the ingredients used shall be thoroughly clean and free from extraneous matter. The fluid portion of the pickles which shall be vinegar, shall constitute not more than 1/3 of the total content and shall not contain any ingredient other than spices and sugar. The pickles shall be free from added copper, mineral acids, alum preservatives or harmful colours and shall show no sign of fermentation. The product shall be reasonably free from sediment.

When more than one vegetables are used the product shall be labelled as "mixed pickles".

Specifications for pickles in citrus juice or in brine

Product	Variety	Minimum percentage of salt	Special Characteristics	General Characteristics
Pickles in citrus juice and in brine.	Any fruit or vegetable of suitable variety.	12	In case of pickles in citrus juice, citric acid shall not be less than 3%. Only citrus fruit juices shall be used.	The vegetables and fruits used in the preparation of pickles shall be wholesome. They shall be free from fungal or insect attack or any type of rot. All the ingredients used shall be thoroughly clean and free from extraneous matter. Only substances that may be added are spices, salt, sugar, jaggery, onions, garlic and soluble calcium salts. Pickles shall be free from added copper, alum, mineral acids or preservatives.

Specifications for oil pickles

Product	Variety	Oil	General Characteristics
Oil Pickles . . .	Any fruit or vegetable of suitable variety.	Any edible vegetable oil like rape seed, mustard, olive oil, etc.	The vegetables and fruits used in the preparation of fruits shall be wholesome and shall be free from fungal or insect attack. The only substances that may be added are spices, salt, sugar, jaggery, onions, garlic and harmless food colour. All the ingredients used shall be thoroughly clean and free from extraneous matter. The pickles shall be of pleasant taste and flavour and be free from added copper, alum, mineral acid or preservatives.

Kind of fruit or vegetable used shall be declared on the label.

Specifications for sun-dried and dehydrated fruit

Product	Variety	General Characteristics
Sun-dried and dehydrated fruits	Any fruit of suitable variety	The fruit used for drying shall be clean, wholesome and shall be practically free from insect or fungal attack. The dried products from such fruits as apples, apricots, peaches, pears, dried mango and fig shall not contain sulphur dioxide in excess of 2000 p.p.m. The product shall be free from visible mould, insect or larvae.

The kind of dried fruit packed in the container shall be declared on the label.

Specifications for sun-dried and dehydrated vegetables

Product	Variety	Special Characteristics	General Characteristics
Sun-dried and dehydrated vegetables.	Any vegetable of suitable variety.	Ash insoluble in Hydrochloric acid shall be not more than 0·5%.	The product shall be prepared from wholesome vegetables free from blight, discolouration or fungi. The only edible portion of the vegetable shall be used and it shall be free from stalks, peels, stems and extraneous leaves. The dried vegetable shall not contain sulphur dioxide in excess of 2000 p.p.m. The finished product shall be of good edible quality and shall reasonably reconstitute to its original shape and quality on boiling from fifteen minutes to an hour. The finished product shall be free from visible mould, insect or larvae.

Kind of dry vegetable shall be declared on the label.

1. Fruit and vegetable products shall be packed in such suitable containers as are described below and all containers shall be securely packed and sealed:

(a) Canned fruits, juice and vegetables. Sanitary top cans made from suitable kind of tin-plate shall be used for canning fruits, juices and vegetables.

(b) Bottled fruits, juices and vegetables. Bottles and jars capable of giving hermetic seal shall be used.

(c) Juices, squashes, crush, cordials, syrups, barley waters and other beverages shall be packed in clean bottles and securely sealed. These products when frozen and sold in the form of ice shall be packed in suitable cartons. Juices or pulp may be packed in wooden barrels when sulphited.

(d) Preserves, jams, jellies and marmalades—New cans, new cannisters, clean jars, bottles, chinaware jars or aluminium containers may be used for packing these products and it shall be securely sealed.

(e) Vinegar, pickles, ketchup, sauces and chutneys. Clean bottles, jars and wooden casks may be used. Pickles, sauces and ketchup when packed in cans shall not contain acetic acid.

(f) Candied fruits and peels and dried fruits and vegetables. Paper bags, cardboard or wooden boxes, new tins, bottles, jars, aluminium or other suitable approved containers shall be used.

2. Following particulars shall be clearly marked on the containers :

(a) Kind and variety of fruit.

(b) Nature of the product, *viz.*, juice, squash, marmalade, etc.

(c) Net weight or volume of the contents (excluding bottled products).

(d) Name of the manufacturer and place of manufacture or the brand owner's name and place of manufacture.

Limits of Heavy Metals in Fruit products

Lead—Not more than 5 parts per million.

Copper—Not more than 15 parts per million.

Zinc—Not more than 19 parts per million.

Tin—Not more than 143 parts per million.

Arsenic and Arsenious oxide—Not more than 1·43 parts per million.

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List of permissible harmless food colours

(a) Caramel.

(b) Cochineal.

(c) Chlorophyll.

(d) Saffron.

(e) Any other harmless vegetable colour.

(f) Following synthetic organic food colours :

1. Indigotine (F.D.C. Blue No. 2),
2. Orange I (F.D.C. Orange No. 1),
3. Amaranth (F.D.C. Red No. 2),
4. Erythrosine (F.D.C. Red No. 3), and
5. Tartrazine (F.D.C. Yellow No. 5).

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Dyes when used in fruit products shall be pure and free from all harmful impurities.

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